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Editorial.

THE FORTHCOMING VETERINARY COMMITTEE.

ALL our readers have, we doubt not, already seen the announcement which appeared officially in the *Times* of 5th September, and has been quoted by most of the newspapers of the country. This announcement was to the effect that a committee, including representatives of the military and civil branches of our profession, is shortly to be assembled, with the view of considering what alterations are necessary in the terms under which officers now serve in the Army Veterinary Department. We rejoice to think that the Government has made this most just and necessary arrangement. We ourselves have on more than one occasion urged the importance of such a measure, and both by word and action have endeavoured to stir the profession to assert its rights as an essential component of any Army scheme, and to vindicate its claims to adequate compensation for the performance of its arduous duties. Whether the articles that have appeared from time to time in the VETERINARY JOURNAL have had any influence, however feeble, in bringing about this desirable result we cannot tell; we hope we have had our humble share of the merit, but in any case the fact is before us, and again we say we rejoice. For it must be remembered that the British Government, though it may be slow and cumbrous in its action, and very difficult to rouse to that action, is essentially an honest and painstaking Government. The results of the Committee's deliberations may prove to be unsatisfactory, and may leave the matter just where it stands, but that remains to be seen, and as honest men and loyal citizens we must give it a chance. The British subject is proverbially a lover of fair play, and his fundamental legal principle is to regard every man as innocent till he is proved guilty. Further, our Government is no despotic conclave or corrupt oligarchy, but a body of true men ruling a free nation; our very Prime Minister holds his post by the votes of his constituents, and has to give an account of his actions at short intervals to these constituents. We must therefore unhesitatingly condemn the utterances of a contemporary who so far forgets the laws of courtesy and good breeding as to talk of the action of the Govern-

ment as an attempt "to draw a red herring across the scent" and "to throw dust into the eyes of the public, and make them think that the whole matter has been arranged." Such words seem to us to constitute almost an insult to the Secretary of State, and to demand an apology. We cannot think that any considerable body of veterinary men will indorse such a violent statement of opinion. Most, we should think, will have read the words we have quoted with a feeling akin to alarm, and will take the earliest opportunity of disavowing them if they are supposed to voice the general feeling of the profession. Such language might come quite well from the mouth of a braggadocio, but we are not a body of braggadocios. It might suit the atmosphere of Turkey or Thibet—where it would have to be uttered under one's breath—but scarcely the atmosphere of Great Britain. The results of the Committee's investigation may, as we have said, prove unsatisfactory and delusive, and may be such as will in the future justify, or at least explain, such bitterness, but we have no reason to anticipate or dread this result. It is recog nised as a matter of etiquette and indeed as a point of honour by all respectable journals that when once a case has come before one of our law courts — and a Parliamentary Committee is a kind of law court — all comment must be hushed. We believe our judges to be incorruptible, and we are justly proud of their incorruptibility; the proceedings in all His Majesty's Courts are held in public, and the daily newspapers report them more or less minutely; we therefore suspend our judgment whilst they are going on. After the decision is given we discuss the matter freely and with such ability as Heaven has bestowed on us, and we take the risk of giving offence or of showing ourselves up as fools or madmen, but we wait till the judges have spoken. In the present case we are told that the Committee is to include representatives of both the military and the civil branches of the veterinary profession, so that there is *primâ facie* evidence of an honest intention on the part of the Government to do justice to all concerned as far as it is possible to do so. The Committee may be badly chosen, and the members may not fairly represent the veterinary opinion or may not be competent to champion our cause, but then again that remains to be seen.

Our contemporary is unfortunately not content with vituperation but goes on to counsel violence. "We urge," he says, "the leaders of the profession to prosecute the boycott with renewed vigour." This is deplorable, and argues a coarseness of fibre which we had hardly believed possible. What will our fellow-countrymen think of us if they read such blatant insolence? It was within our rights to refuse service to the Government if we disapproved of the terms and conditions; we were quite entitled to enter into a compact for this purpose and to counsel the younger and less experienced members of the profession to join with us if we thought there was no other way of obtaining redress or of drawing

public attention to our grievances. An inert body like a Government often requires a strong stimulant of this kind to force it into action, but the stimulant has been applied and has had the desired effect. To counsel further appliance of violent remedies is at once unscientific and undignified. We trust that the common sense and courtesy of the profession will once more prevail, and that the advice and opinions of our contemporary will be loudly disclaimed. We can only repeat what we have said : let the constitution of the Committee be carefully scanned, let their deliberations be closely watched, let their decisions be criticised keenly and fearlessly, but in the name of justice and honesty let us suspend our judgment till after the event.

Original Papers.

MEETING OF BRITISH ASSOCIATION AT BELFAST, 1902.

THE Annual Meeting was held this year in Belfast, and amongst many valuable contributions to science we publish some which are of special importance and value to Veterinarians. The first one is the address delivered on the 12th September by the President of the Physiology Section —namely, Professor W. D. Halliburton, who took as his subject the present position of Chemical Physiology. Claiming that this branch of science is rapidly becoming an exact science, he pointed out the increasing importance attributed by physiologists to the study of inorganic chemistry, and their application of doctrines of physical chemistry, such as ionization, to the explanation of physiological phenomena. He emphasised the necessity of bold experiment and of bold theorising from the *data* obtained, and illustrated his position by reference to the work of Pawlow on digestion and of Ehrlich on immunity as follows :—

"Let me now press upon you the importance in physiology, as in all experimental sciences, of the necessity first of bold experimentation, and secondly of bold theorising from experimental *data*. Without experiment all theorising is futile; the discovery of gravitation would never have seen the light if laborious years of work had not convinced Newton that it could be deduced from his observations. I purpose to illustrate these general remarks by a brief allusion to two typical sets of researches carried out during recent years in the region of chemical physiology, those of Ehrlich and of Pawlow. The work of Ehrlich mainly illustrates the useful part played by bold theorising, the work of Pawlow that played by the introduction of new and bold methods of experiment. Pawlow has by his new methods succeeded in throwing an entirely new light on the processes of digestion. The main thing that he has shown is that digestion is not a succession of isolated acts, but each one is related to its predecessor and to that which follows it; the process of digestion is thus a continuous whole; for example, the acidity of the gastric juice provides for a delivery of pancreatic juice in proper quantity into the intestine; the intestinal juice acts upon the pancreatic, and so enables the latter to perform its powerful actions. Further, the composition of the various juices is admirably adjusted to the needs of the organism; when there is much proteid to be digested, the

proteolytic activity of the juices secreted is correspondingly high, and the same is true for the other constituents of the food. It is such general conclusions as these, the correlation of isolated facts leading to the formulation of the law that the digestive process is continuous in the sense I have indicated and adapted to the needs of the work to be done, that constitute the great value of the work from the Russian laboratory. Work of this sort is sure to stimulate others to fill in the gaps and complete the picture, and already has borne fruit in this direction. The other series of researches to which I referred are those of Ehrlich and his colleagues and followers on the subject of immunity. The power the blood possesses of slaying bacteria was first discovered when the effort was made to grow various kinds of bacteria in it; it was looked upon as probable that blood would prove a suitable soil or medium for this purpose. It was found in some instances to have exactly the opposite effect. The chemical characters of the substances which kill the bacteria are not fully known; indeed, the same is true for most of the substances we have to speak of in this connection. Absence of knowledge on this particular point has not, however, prevented important discoveries from being made. So far as is known at present, the substances in question are proteid in nature. The bactericidal powers of blood are destroyed by heating it for an hour to 56° C. Whether the substances are enzymes is a disputed point. So also is the question whether they are derived from the leucocytes; the balance of evidence appears to me to be in favour of this view in many cases at any rate, and phagocytosis becomes more intelligible if this view is accepted. The substances, whatever be their source or their chemical nature, are sometimes called alexins, but the more usual name now applied to them is that of *bacterio-lysins*. Closely allied to the bactericidal power of blood, or blood-serum, is its globulicidal power. By this one means that the blood-serum of one animal has the power of dissolving the red blood-corpuscles of another species. Another interesting chemical point in this connection is the fact that the bactericidal power of the blood is closely related to its alkalinity. Increase of alkalinity means increase of bactericidal power. Alkalinity is probably beneficial because it favours those oxidative processes in the cells of the body which are so essential for the maintenance of healthy life. Normal blood possesses a certain amount of substances which are inimical to the life of our bacterial foes. But suppose a person gets run down; every one knows he is then liable to "catch anything." This coincides with a diminution in the bactericidal power of his blood. But even a perfectly healthy person has not an unlimited supply of bacteriolysin, and if the bacteria are sufficiently numerous he will fall a victim to the disease they produce. Here, however, comes in the remarkable part of the defence. In the struggle he will produce more and more bacteriolysin, and if he gets well it means that the bacteria are finally vanquished, and his blood remains rich in the particular bacterio-lysin he has produced, and so will render him immune to further attacks from that particular species of bacterium. Every bacterium seems to cause the development of a specific bacterio-lysin. Immunity can more conveniently be produced gradually in animals, and this applies, not only to the bacteria, but also to the toxins they form. If, for instance, the bacilli which produce diphtheria are grown in a suitable medium, they produce the diphtheria poison, or toxin, much in the same way that yeast-cells will produce alcohol when grown in a solution of sugar. Diphtheria toxin is associated with a pro-

teose, as is also the case with the poison of snake venom. If a certain small dose called a "lethal dose" is injected into a guinea-pig the result is death. But if the guinea-pig receives a smaller dose it will recover; a few days after it will stand a rather larger dose; and this may be continued until after many successive gradually increasing doses it will finally stand an amount equal to many lethal doses without any ill effects. The gradual introduction of the toxin has called forth the production of an antitoxin. If this is done in the horse instead of the guinea-pig the production of antitoxin is still more marked, and the serum obtained from the blood of an immunised horse may be used for injecting into human beings suffering from diphtheria, and rapidly cures the disease. The two actions of the blood, antitoxic and antibacterial, are frequently associated, but may be entirely distinct. The antitoxin is also a proteid probably of the nature of a globulin. There is no doubt that in these cases the antitoxin neutralises the toxin much in the same way that an acid neutralises an alkali. If the toxin and antitoxin are mixed in a test-tube, and time allowed for the interaction to occur, the result is an innocuous mixture. The toxin, however, is merely neutralised, not destroyed; for if the mixture in the test-tube is heated to 68° C. the antitoxin is coagulated and destroyed, and the toxin remains as poisonous as ever.

"EHRLICH'S HYPOTHESIS.

"Ehrlich's hypothesis to explain such facts is usually spoken of as the side-chain theory of immunity. He considers that the toxins are capable of uniting with the protoplasm of living cells by possessing groups of atoms like those by which nutritive proteids are united to cells during normal assimilation. He terms these haptophor groups, and the groups to which these are attached in the cells he terms receptor groups. The introduction of a toxin stimulates an excessive production of receptors, which are finally thrown out into the circulation, and the free circulating receptors constitute the antitoxin. The comparison of the process to assimilation is justified by the fact that non-toxic substances like milk introduced gradually by successive doses into the blood-stream cause the formation of anti-substances capable of coagulating them. Up to this point I have spoken only of the blood, but month by month workers are bringing forward evidence to show that other cells of the body may by similar measures be rendered capable of producing a corresponding protective mechanism. One further development of the theory I must mention. At least two different substances are necessary to render a serum bactericidal or globulicidal. The bacteriolysin or hæmolysin consists of these two substances. The repeated injection of the blood of one animal (*e.g.*, the goat) into the blood of another animal (*e.g.*, a sheep), after a time renders the latter animal immune to further injections, and at the same time causes the production of the serum which dissolves readily the red blood-corpuscles of the first animal. The sheep's serum is thus hæmolytic towards goat's blood-corpuscles. This power is destroyed by heating to 56° C. for half an hour, but returns when fresh goat's serum is added. The specific immunizing substance formed in the sheep is called the immune body; the ferment-like substance destroyed by heat is the complement. The latter is not specific, since it is furnished by the blood of non-immunised animals, but it is nevertheless essential for hæmolysis. Ehrlich believes that the immune body has two side groups—one which connects with the receptor of the red corpuscles and one which

unites with the haptophor group of the complement, and thus renders possible the ferment-like action of the complement on the red corpuscles. Various antibacterial serums which have not been the success in treating disease they were expected to be are probably too poor in complement, though they may contain plenty of the immune body. Quite distinct from the bactericidal, globulicidal, and antitoxic properties of blood is its agglutinating action. This is another result of infection with many kinds of bacteria or their toxins. The blood acquires the property of rendering immobile and clumping together the specific bacteria used in the infection. The test applied to the blood in cases of typhoid fever, and generally called Widal's reaction, depends on this fact. The substances that produce this effort are called agglutinins. They also are probably proteid-like in nature, but are more resistant to heat than the lysins. Prolonged heating to over 60° C. is necessary to destroy their activity. Lastly, we come to a question which more directly appeals to the physiologist than the preceding, because experiments in relation to immunity have furnished us with what has hitherto been lacking, a means of distinguishing human blood from the blood of other animals. The discovery was made by Tchistovitch (1899), and his original experiment was as follows:—Rabbits, dogs, goats, and guinea-pigs were inoculated with eel-serum, which is toxic; he thereby obtained from these animals an antitoxic serum. But the serum was not only antitoxic, but produced a precipitate when added to eel-serum, but not when added to the serum of any other animal. In other words, not only has a specific antitoxin been produced, but also a specific precipitin. Numerous observers have since found that this is a general rule throughout the animal kingdom, including man. If, for instance, a rabbit is treated with human blood, the serum ultimately obtained from a rabbit contains a specific precipitin for human blood—that is to say, a precipitate is formed on adding such a rabbit's serum to human blood, but not when added to the blood of any other animal. The great value of the test is its delicacy; it will detect the specific blood when it is greatly diluted, after it has been dried for weeks, or even when it is mixed with the blood of other animals."

In the section on Botany the President, Professor J. Reynolds Green, F.R.S., on the 12th September took for his subject the field of Vegetable Physiology.

In the course of his observations Professor Green said that to his mind the possibilities of the living organism as such presented a fascination which was not afforded by the dry bones of morphology or histology. Valuable as researches into the latter were, they seemed to him to deprive their importance very largely from the past, from the possibility of indicating or ascertaining the line of descent of living forms and the relation of the latter to their remote ancestors. The interest thus excited seemed to him to be rather of an academic character when compared with the actual problems of present-day life, its struggles, triumphs, and defeats in the conflict for existence waged to-day by every living organism. But apart from the considerations of the claims of vegetable physiology based upon its own intrinsic scientific value and the interest which its problems possessed for the worker himself, and upon the place accorded to it as its relationship to morphology, it must be recognised as being of fundamental economic importance, especially in these times of agricultural depression. For many years now it had been recognised that agriculture was based upon science;

that it involved, indeed, properly the application of scientific principles to the cultivation of the soil. But when they looked back upon what had passed for agricultural science since the alliance between the two had been admitted, they could not but recognise how lamentably deficient in breadth it had been. The chemical composition of the soil and subsoil had been investigated with some thoroughness in many districts of the country. The effect of its various constituents on the weight and quality of the crops cultivated in it had been exhaustively inquired into, and a considerable amount of information as to what minerals were advantageously applied to the soil in which particular plants were to be sown had been acquired. Till quite recently the physiological idiosyncrasies of the plants round which all these inquiries centred were almost entirely ignored. No serious attempt was made to ascertain the way in which a plant benefited by or suffered from the presence of a particular constituent of the soil. For the advance of agriculture the study of the plant itself must now be added to the study of the soil. The fact that it was a living organism possessing a certain variable and delicate constitution, responding in particular ways to differences of environment, capable of adapting itself to a certain extent to its conditions of life, dealing in particular ways with different nutritive substances, must not only be recognised but must be the basis for the future, which would thus supplement and enlarge the conclusions derived from those of the past, in some respects correcting them, in others establishing them on a firmer basis. Vegetable physiology was allied very closely to other sciences, and research into its mysteries involved more than a preliminary acquaintance with them. Especially must one point out the importance, indeed the necessity of acquaintance with a certain range of organic chemistry and with chemical methods of work. In certain directions, too, physics were as much involved as chemistry in others. Recognising the importance of work in this field, and realising that with the advent of a new century new departures must be taken, he ventured to direct attention to the present position of certain problems which had long been the subjects of speculation and which offered the prospect, if not of complete solution, at any rate of considerable advance if investigated by modern methods.

THE NUTRITIVE PROBLEMS OF PLANTS.

There were several theories abroad as to the progress of events during photosynthesis, none of which could be regarded as entirely satisfactory. For many reasons it seemed desirable that this question should be thoroughly investigated in the light of the present condition of both chemical and physical science. He ventured to recall the principal hypothesis of carbohydrate formation which had been advanced, so that its present position might be properly appreciated. The view that had met with the widest acceptance was that of Baeyer. On his hypothesis the carbon dioxide absorbed was decomposed under normal conditions to yield carbon monoxide and oxygen; a corresponding and coincident decomposition of water led to the production of free hydrogen and oxygen. The oxygen from both sources was exhaled, while the carbon monoxide and hydrogen combined to form formaldehyde. The formaldehyde gave rise by a process of polymerisation to some form of sugar. These views involved several definite stages of action of which the most important seemed the production of carbon monoxide and hydrogen, the formation of formaldehyde, and the construction of a sugar. If they examined the work that had been pub-

lished bearing on the probability of the formation of carbon monoxide in the plant they found little that was satisfactory. The statements that had been made were opposed to the idea that carbon monoxide was of value in nutrition. It was said that when supplied to a plant instead of carbon dioxide it did not lead to the formation of carbohydrates. It was further advanced that this gas was of a very deleterious nature, and if formed would result in the speedy death of the protoplasm of the cell in which it originated. This idea was, of course, specious; but it did not appear to be well founded. The deadly character of carbon monoxide when inhaled by a human being depended upon a peculiar interference which it caused with oxygen-carrying power of the red blood corpuscles. The pigment hæmoglobin to which these little bodies owed their usefulness formed a loose chemical combination with oxygen, the compound being formed in the blood-vessels of the lungs and being decomposed with the liberation of the oxygen in those of the tissues of the body. It was evident, therefore, that the value of the corpuscles as oxygen-carriers depended upon their hæmoglobin. When this pigment was exposed to carbon monoxide it combined with it in the same way as it did with oxygen, forming, however, a more stable compound. The affinity for this gas which the pigment manifested was very considerable. Hence the poisonous nature of carbon monoxide. It was easily seen that the latter was a poison, because it threw out of gear and temporarily paralysed a most essential part of the mechanism of respiration, effectually preventing oxygen from reaching the tissues of the body. There was no evidence here that it exerted even a deleterious influence upon the living substance itself. The only poisonous effect it would be able to exert on the plant would necessarily be of the latter character, for there was no oxygen-carrying mechanism that could be interfered with. They could not lay any stress, therefore, on the objection to Baeyer's view, based upon the action of carbon monoxide upon the human organism. It was important to take into account the factor of sunlight, on which the power of photosynthesis depended. Should carbon monoxide prove capable of serving as a basis for the formation of carbohydrates, the question would arise, was the activity of the chlorophyll in sunlight confined to the preliminary formation of carbon monoxide from the dioxide, or was the energy derived from the light brought to bear upon the subsequent constructive processes? There was little or no accurate information as to the way in which the energy was utilised after absorption by the chlorophyll.

VEGETABLE PHYSIOLOGY AND PHYSICS.

This opened up a very important but very difficult line of work, which brought home to them the intimate dependence of vegetable physiology upon physics. The absorption of energy from without, in the form of the radiant energy of the solar rays, was certainly a fact. The spectrum of chlorophyll showed a number of absorption bands, whose position corresponded with the position in the spectrum of the places where oxygen was liberated in photosynthesis. But the transformation and applications of energy in the body of the vegetable organism needed much closer examination. The intimate relationship between the different manifestations or forms of energy and the ways in which they can be transformed into one another have been very minutely scrutinised in recent times. The electrical phenomena connected with the movements of the leaves of the Venus's fly-trap (*Dionæa muscipula*) had been examined with considerable com-

pleteness by Burdon Sanderson, and they had learned that the vegetable and animal organisms showed considerable similarities in this respect. Recently, again, Bose had made important contributions to the subject of the electrical responses to stimulation that could be observed under particular conditions. A promising beginning had thus been made, but only a beginning. The electrical condition of the normal plant under different conditions of rest and activity had still to be investigated. Another problem connected with the action of chlorophyll was associated with the absorption of radiant energy by the different regions of the spectrum. Bands of considerable intensity were noticeable in the blue and violet, though the deepest absorption took place in the red. Yet Engelmann's classic bacterium method showed that very little evolution of oxygen took place in the position of these bands in the blue and violet. The fact that absorption of radiant energy and photosynthetic activity showed no quantitative relationship was, of course, not new, but the reason remained still to be discovered. Van Tieghem had suggested that there were two factors concerned in the action of chlorophyll—the elective absorption of light shown by the occurrence of the absorption bands in the spectrum, and the calorific energy of the absorbed radiations. Timiriazeff, in his classical researches on the liberation of oxygen by the leaves of the bamboo when exposed in tubes of small calibre to a large spectrum, found that the amount of carbon dioxide decomposed by leaves was proportional to the distribution of effective calorific energy in the spectrum. Van Tieghem's hypothesis that this was a matter of calorific energy might prove to be erroneous, and yet his views might rest on some sound basis. It might be a matter in which electrical rather than calorific energy might be concerned. Appealing to the experience of various observers there seemed on the whole to be a balance of evidence in favour of the power of plants to live and prosper in an atmosphere containing a very considerable percentage of carbon monoxide. The question of the possibility of the latter replacing the dioxide, as the theory appeared to require, was complicated very seriously by the differences of solubility between them. Carbon dioxide dissolved very readily in water and in cell sap; carbon monoxide was almost insoluble in either. It would be of considerable interest to inquire whether if carbon monoxide was liberated at the outset of the photosynthetic processes its combination with other groupings could take place apart from the action of chlorophyll. If so the fungi should be capable of carbohydrate construction if supplied under proper conditions with the monoxide and with hydrogen. The proper conditions, however, might be extremely difficult to establish.

FORMALDEHYDE IN PLANTS.

The next stage in the constructive process afforded still ample room for investigation. The presence of formaldehyde was not the hypothesis of Baeyer alone, but was demanded according to Bach's views, though the stages of its hypothetical construction were not the same. They had therefore to ask whether formaldehyde could be detected in plants, and if so whether the conditions under which it might exist admitted of its being considered an up-grade product in photosynthesis. Of all the antiseptics now available to the bacteriologists it was perhaps the most potent, even traces being fatal to the form of vegetable protoplasm which was found in bacteria. It might be argued that it must be equally deleterious in the cell

containing chlorophyll and to the chloroplast itself, as they had no reason to suppose that any difference in vitality existed between the protoplasm of different plants. But little success had attended hitherto the attempt to show that formaldehyde in the presence of chlorophyll, or, preferably, he might say, of chloroplasts, could give rise to carbohydrates. They had nothing more satisfactory than Bokorny's experiments, in which, after failing to set up photosynthesis in a filament of Spirogyra fed with formaldehyde, he succeeded when he supplied the alga with its compound with sodium-hydrogen-sulphite. Experiments on a more comprehensive scale, conducted on a variety of plants of different habits, were needed before they could regard the process as satisfactorily established. They had further to pursue the problem by an inquiry as to the nature of the sugar first formed. The condensation of formaldehyde which could be brought about by the action of basic lead carbonate led to the formation of several sugars, each yielding its characteristic osazone. How far the condensation in the plant followed this was still uncertain. It was quite possible that stages intervened between formaldehyde and sugar of any kind. It had been suggested that formaldehyde in the presence of water might under the conditions obtaining in the leaf give rise to glycolaldehyde, a body which formed sugar very readily indeed. The formation of sugar directly from formaldehyde was a much longer process and was attended with greater difficulty.

CHLOROPHYLL AND OTHER PIGMENTS.

Remarkably little was known about the chlorophyll itself. It had so far been found impossible to extract it from the chloroplast without causing its decomposition, and hence their ideas of its constitution, such as they were, were based upon the examination of something differing in some not well-ascertained particulars from the pigment itself. A remarkable relationship was known to exist between the latter and iron, for unless this metal was supplied to a plant its chloroplasts did not become green. But the condition of the iron in the plant was uncertain; it seemed probable that it did not enter into the molecule of the pigment at all. A remarkable series of resemblances between derivatives of chlorophyll and derivatives of hæmatin, the colouring matter of hæmoglobin, had been brought to light by the researches of Schunck and Marchlewski, which was very suggestive. The same leaning towards iron was found in the two pigments, but in the case of hæmatin knowledge was further advanced than in that of chlorophyll. The iron was known to be part of its molecule. Further researches might throw a light on this curious relationship, perhaps showing that chlorophyll might enter into a combination with carbon dioxide as hæmatin did with oxygen. Such a combination might well be the precursor of the decomposition of the carbon dioxide. There was another pigment met with in many plants, the physiogical significance of which had in recent years begun to attract some attention. This was the red colouring matter, *anthocyan*, apparently related to the tannins, which was developed especially in the young leaves of shade-loving plants when they become exposed to illumination exceeding the intensity which they normally encountered. The formation of this pigment was greatest in tropical plants. It seemed in some way to be supplementary to chlorophyll, for its absorption spectrum showed that it allowed all the rays useful in photosynthesis to pass through it. It was unlikely that it took any share in photosynthesis. Several

theories have been advanced to explain its presence, but there was little positive information bearing upon either the formation or the function of the pigment. Very little progress had been made with the problem of the construction of proteid matter in the plant, which still confronted them. The question of its relation to the mechanism of photosynthesis had received some attention without leading to any satisfactory conclusion. The question of the energy made use of in proteid construction was in an equally unsatisfactory condition.

ALCOHOL AND THE NUTRITION OF THE PLANT.

Among the problems connected with the nutrition of the plant, the part played by alcohol had recently come into prominence. Alcohol was originally associated only with the lower fungi, and especially with the yeast plant. Biological problems of grave importance arose in connection with the Saccharomyces, apart from what seemed at first the larger question, viz., the nature of fermentation. A prolonged study of the latter phenomenon led Pasteur to the view that alcoholic fermentation was only the expression of the partial asphyxiation of the yeast, and its efforts to obtain oxygen by the decomposition of the sugar. Pasteur's explanation of the behaviour of the yeast was such as to connect it with the respiration of the plant. Schützenberger claimed that the matter rather concerned nutrition than respiration, and certain facts more recently discovered supported strongly the view that the nutrition of the yeast was the chief object of the process normally, though it could not be denied that when partial asphyxiation set in fermentation was resorted to by the plant in its difficulty, that it might obtain the energy normally supplied by the respiratory processes. The mode of decomposition of the sugar, however, the formation of alcohol and carbon dioxide, raised a question as to the exact form in which the nutritive material was supplied to the protoplasm. From his own experiments and those of other authors Mazé concluded that alcohol was formed in the living cells of seeds at the expense of grape sugar by virtue of a normal diastasic process which made them approach yeast cells more closely than had been suggested by any of the experiments hitherto published. They might inquire further how far the evidence pointed to the probability that the molecule of sugar was split up in that way into alcohol and carbon dioxide, and that the alcohol was the nutritive part of the sugar molecule. Certainly Mazé's experiments on submerged seeds with the plumule exposed above the water were not inconsistent with that view. Duclaux had spoken more definitely still on this point, and had said that the alcohol formed became a true reserve material to be used for nutriment. The results of experiments in this connection led to the consideration of the mode in which the carbohydrates, and particularly the sugars, were assimilated by the plant. They had held the view that the sugar molecule was capable of entering with little, if any, alteration into that of protoplasm. It was possible to detect sugar in the axis of a plant till quite near its growing point. Then the reaction ceased to be obtainable, and they knew that assimilation was taking place. But they had still to investigate the steps, no very easy problem to undertake. Might it possibly be that it was the alcohol moiety of the sugar which the protoplasm took up, part of the carbon dioxide evolved by the growing organ being an expression, not of respiration, but of a fermentation preliminary to assimilation?

THE GERMINATION OF SEEDS.

He passed now to consider briefly another nutrition problem of a rather different kind. The germination of seeds was a question that might be thought to have been fairly settled by the investigations of the latter half of the last century. They had come to the conception of the seed as fundamentally a young embryo lying quiescent within its testa, and provided with a store of nourishment deposited either within its own substance, or lying round it in the tissues vaguely named endosperm or perisperm. The nourishment had been held to be practically ready for its use, needing only a certain amount of enzyme action to be applied to it to convert the food store from the reserve to the nutritive condition. They had recognised here starch, proteids, and glucosides, and had ascertained that the embryo could furnish the appropriate enzymes for their digestion. Each reserve store had apparently been quite independent of the rest, and the embryo had had control of the whole. Certain considerations, however, led to the view that for albuminous seeds at any rate this mode of looking at the matter was no longer satisfactory. Recently his own work had been bearing on this question, particularly as regards the behaviour of the seeds of Ricinus during germination. The reserves of this seed were mainly composed of oil and aleurone grains, hardly a trace of carbohydrates being present. At the onset of germination there was a remarkable appearance of both cane sugar and glucose, which increased as the oil diminished. This old view advanced to explain this fact had been the transformation of the oil directly into the sugars or one of them, a theory which it was difficult to reconcile with the chemical possibilities of oil. He had found that side by side with the appearance of the sugar there was also the formation of a considerable quantity of lecithin, a fatty body containing nitrogen and phosphorus. The seed contained a comparatively large amount of phosphorus in the form of the well-known globoids of the aleurone grain, a double phosphate of calcium and magnesium. The occurrence of this body pointed to a considerable interaction of various substances existing in the seeds, the phosphorus apparently coming from the globoids, and the nitrogen from the proteids. Instead, therefore, of the fat being transformed into sugar it seemed certain that a very considerable metabolism was set up, in which the various constituents of the endosperm interacted very freely together. He was informed by Mr. Biffin, who had investigated the histological change accompanying the germination, that the protoplasm of the endosperm cells appeared to increase in amount very greatly during the early stages. The observations suggested a very vigorous resumption of metabolic activity by the cells of the endosperm, in the course of which the various reserves were brought into relation with the living substance of the cells, and a number of new products were formed to minister to the nutrition of the growing embryo. The formation of the sugars might more probably be referred to the renewed activity of the protoplasm of the parent gametophyte than to a direct transformation of the fat under the influence of embryo. Further researches upon a large variety of seeds appeared necessary to give a true idea of the processes of germination. What now appeared probable in the case of fatty seeds might prove to be true also in case of those which had other varieties of reserve material.

ELECTRICAL PHENOMENA IN PLANTS.

Some very striking results were only a month ago published by Bose on

the electric response in ordinary plants to mechanical stimulation. He arranged a piece of vegetable substance, such as the petiole of the horse-chestnut, or the root of a carrot or radish, so that it was connected with a galvanometer by two non-polarisable electrodes. The uninjured tissue gave little or no evidence of the existence of electrical currents; but if a small area of its surface was killed by a burn or the application of a few drops of strong potash, a current was observed to flow in the stalk from the injured to the uninjured area, just as was the case in animal tissue. The potential difference in a typical experiment amounted to ·12 volt. The tissue was then stimulated, either by tapping or by a torsion through a certain angle, and at once a negative variation or current of action was indicated, the potential difference being decreased by ·026 volt. Very soon after the cessation of the stimulus the tissue recovered, and the current of rest flowed as before. Bose's investigations extended considerably beyond this point, and established a very close similarity in behaviour between the vegetable substance and the nerves of animals. Summation effects were observed, and fatigue effects demonstrated, while it was definitely shown that the responses were physiological. They ceased entirely as soon as the piece of tissue was killed by heating. This remarkable demonstration of similar electrical properties to those possessed by nerve strengthened very greatly the view of the conduction of stimuli in the plant by means of the porto-plasmic threads which have been demonstrated by Gardiner and others to exist throughout the plant, uniting cell to cell into one coherent whole.

THE PATHOLOGY OF PLANTS.

In conclusion, he would call attention to the vast field opening up in connection with the pathology of plants. The work done by their predecessors had been more largely work on the morphological peculiarities of various fungi than upon the physiological changes which constituted pathology, properly so called. It was only recently that attention had been called to the broad questions of disease in plants. Even now, however, certain advances had been made, and the direction of research was taking shape. In the science of pathology little in recent years had been so fascinating as the question of immunity against the attacks of certain diseases, either hereditary or acquired. It had been bound up with the very large question of toxins and their attenuation, their opposites, the antitoxins, and matters of a similar nature. Great results had been attained in human pathology, with which it was not for him to deal. He mentioned them because they were face to face with the possibility of treating some of the diseases of plants in a similar way, and perhaps on the threshold of very far-reaching discoveries. He might call attention to the researches of Ray and of Beauverie upon the general question of plant infection, and especially upon a disease set up by a fungus known as *Botrytis cinerea*, which attacked grapes, begonias, and other plants. The fungus existed in three forms, one of which was a harmless saprophyte, another a destructive parasite, and a third intermediate between the two. The first was a very common fungus, developing on decaying plants and bearing ordinary gonidia or spores. The second was completely filamentous, and bore no reproductive organs. It was produced when the air was heavily charged with moisture and the temperature high, conditions of common occurrence in forcing-houses. The third was an attenuated form intermediate between the other two. It bore gonidia like those of the

first, and in addition others which germinated without falling off the parent plant and elongated into long threads. Many plants could bear the invasion of this plant without suffering greatly, though it could not be called harmless. It occurred chiefly when a high temperature was associated with a considerable amount of moisture in the air. Researches of a somewhat kindred nature dealing with the infection of particular plants by specific fungi had been communicated recently to this section by Professor Marshall Ward in his paper read last year on the Bromes and their brown rust. They brought to light many very important facts connected with the question of adaptive parasitism and immunity. Few questions in vegetable physiology could compare in economic importance with these when they thought of their possible development in relation to agriculture. It had been impossible in an address like that to do more than indicate some of the more important problems awaiting investigation. Might they hope that all such work would be vigorously conducted, but that the conclusions reached would be scrutinized with the greatest care and subjected to repeated examination? Great hindrances to the advance of the science resulted from dogmatic assertions made by eminent men in the past, their personal influence having led to their conclusions, not altogether accurate, being nevertheless almost universally accepted. Many years subsequently these conclusions had needed re-examination, the result being the destruction of a whole fabric that had been reared upon this unworthy foundation. He might close by an appeal to the younger school of botanists to take some of this work in hand, and by assiduous and critical experiment and observation to contribute to the solution of the problems pressing upon them in this field.

BOARD OF AGRICULTURE.

ANNUAL REPORTS OF PROCEEDINGS UNDER THE DISEASES OF ANIMALS ACTS, THE MARKETS AND FAIRS (WEIGHING OF CATTLE), ACTS, &c., FOR THE YEAR 1901.

We have received the usual Annual Reports of the Board of Agriculture for 1901. The reports are very much the same as usual. We have no rinderpest, pleuro-pneumonia, or sheep-pox, but we have, or very recently had, rabies, foot-and-mouth disease, and swine-fever, and an ever-increasing number of cases of glanders and anthrax. Mr. Cope, the principal veterinary officer, in his prefatory remarks, says:—

"Since the year 1897 some very important additions have been made to the veterinary staff. In that year three additional non-established veterinary inspectors were added, chiefly in connection with the final and successful efforts then made by the Board for the eradication of pleuro-pneumonia, which still lingered among the cows in the sheds in the East End of London after the disease had been eradicated in other parts of the country.

"At the conclusion of this work the Board decided to retain these additional officers for the purpose of conducting inquiries into swine-fever, which at that time was very widely spread and prevalent in various parts of the country. The result having proved eminently satisfactory in every way,

the Board decided to add to the number, and accordingly six more duly qualified veterinary surgeons were selected and added in 1899 to the staff, which was again augmented in 1901, so that at the present time the veterinary staff of the Board is numerically much greater than at any previous period since the Professional Department was created in the year 1865. It now consists of a Chief and an Assistant Veterinary Officer, and twelve non-established Veterinary Inspectors, all of whom give their whole time to the service of the Board. In addition nine Veterinary Inspectors are engaged in examining foreign animals at the ports of landing, four of whom are established civil servants.

"The advantages derived from this increase of the veterinary staff have been very considerable. The main duties of the inspectors have been in connection with swine-fever, but they are at times employed upon other work of important character.

"Formerly, before taking any action in connection with foot-and-mouth or any other disease, the Department had to await the receipt of a report of an outbreak of disease. Under the new system the policy has been to endeavour to seek out and discover each outbreak as quickly as possible, in order that prompt action may be taken for arresting its extension instead of waiting for it to be reported. This is a duty which can only be fulfilled by a veterinarian, and a farm to farm visitation by professional officers of the Board during the recent outbreaks of foot-and-mouth has not only been most successful, but has become so popular with agriculturists that they are always willing to aid them in their inquiries. These inspectors have also been found most useful and necessary to assist in the inspection at the ports in cases of emergency, especially when cargoes of diseased animals have arrived, when their special knowledge of the measures necessary for the prevention of the spreading of infectious diseases becomes of considerable value to the Department."

Mr. Cope, with reference to swine-fever, says :—

"During the year no fewer than 4339 sets of viscera were forwarded from 71 counties in Great Britain for examination at the Board's Laboratory, and in 3140 instances the lesions of swine-fever were detected.

"During the past year the local veterinary surgeons have, as a whole, given a much greater amount of time, and exercised much more care in conducting post-mortem examinations than formerly, and one result of considerable interest which has followed has been that they have brought under our notice a very large number of instances in which hæmorrhages have been present on the mucous membrane of the larynx, associated in many cases with necrosis of the epiglottis.

"It has often been observed by those who have had opportunities of examining pigs affected with swine-fever that one of the most frequent clinical symptoms is an incessant sharp irritating cough, generally supposed to be due to a diseased condition of the lungs. The second Report of the Swine-Fever Scientific Committee, dated 1897 [C.—8372], drew attention, however, to the fact that in nearly all the instances in which pneumonia was found to be present in the pigs of this country the disease was sporadic and due to the presence of organisms of a saprophitic nature, and was not contagious or epizootic. The results of these further inquiries go to show that the most common cause of the frequent cough is the diseased condition not of the lungs but of the larynx and trachea, upon the mucous membrane of which are to be found lesions similar in character to those present in the intestinal track, viz., hæmorrhage and necrosis.

"It is somewhat unsatisfactory to find that an impression still exists that swine-fever may be produced by a variety of causes other than the introduction of the specific organism (which is the cause of the disease) into the system of the pig.

"One theory has been propounded that food-stuffs imported from abroad will produce swine-fever when given to pigs in this country. A second is that the swill and refuse from hotels and other large establishments will also produce that disease. And lastly, the old theory that swine-fever and typhoid fever or enteric in man are similar diseases, is by some still maintained, outbreaks not infrequently occurring amongst the pigs at asylums and workhouses, and in districts where the latter disease has existed. These views, however, have only been expressed in those special instances where all attempts to trace the true origin of the outbreak have failed.

"It must be obvious to all who are interested in this subject that if there be any foundation for these statements it would be futile to attempt to eradicate swine-fever, as these causes, if they existed, could never be controlled. And as each of these propositions has an important bearing upon the possible results which may be obtained from the efforts which are now being made to stamp out swine-fever, it is proposed to consider them from the point of view of their feasibility, based upon those facts which are now available.

"In the case of the food-stuffs imported from abroad, it may be generally stated that the greater part of it comes from the United States of America, in which country swine-fever is prevalent, while part of it comes from Canada, where a comparative small number of outbreaks occur during the year. The possibility of such food-stuffs becoming infected with the swine-fever organism is, however, very remote. I am assured by a reliable authority that pigs reared in the United States have practically no opportunity of coming into contact with the maize or wheat exported. All grain of this description, after being cut and thrashed, is put directly into trucks and exported in bulk from that country, and the same remark applies generally to this class of food imported from Canada.

"As regards the second proposition, namely, that swine-fever may be produced by the swill or refuse from hotels and other large establishments, it may be pointed out that deaths often occur among pigs which are fed upon such material in consequence of the presence therein of the large quantity of common salt which it contains. But the appearances present in the stomach and digestive organs of a pig which has died from what is termed 'brine poisoning' are quite dissimilar to the leisons found in swine-fever. Many hundreds of specimens have been forwarded to the Board's laboratory taken from animals which have been killed by the action of brine, but the appearances are totally different, and can be easily differentiated from those which are the result of swine-fever.

"A much more feasible explanation of these unaccountable outbreaks is, that although the owner is unaware of it, his pigs have been infected by some indirect means, and that they would have fallen with swine-fever even if they had not been fed upon foreign food-stuffs or swill."

On page 15 commences a statement of great interest to horse-owners throughout the country. It refers to the importation of horses into this country from foreign countries, and paragraphs 6 and 7 are most significant, and we quote them in full:—

"6. At London no kind of examination appeared at any time to have been conducted by the Local Authority. The Board therefore thought it desirable that they should themselves institute inquiries, and carry out an inspection as far as possible of all horses landed in the docks, through the agency of their own veterinary staff. Arrangements were accordingly made with the various steamship companies, who offered every facility for the purpose, and advised the Department of the names of the carrying vessels, the docks in which they would be placed, and the probable time of their arrival. The report of the Board's Inspector goes to show that the majority of the horses which come from the United States and Canada to the Port of London are landed in the Royal Albert Dock or in Tilbury Dock. Cargoes of horses, exported chiefly from Russia, are also landed in the Millwall Docks. The inquiry extended over a period of thirteen weeks, during which twenty-four cargoes were inspected, some of which contained upwards of 200 horses. Out of a total of 2376 horses shipped from New York and examined on arrival in London only four were found to be affected with that form of influenza which is commonly termed pink-eye, ten were the subjects of strangles, and a few animals were affected with an ordinary catarrh.

"7. It was also ascertained that the largest importing company which is engaged in the United States trade employs a veterinary surgeon to examine the horses on arrival, and that it is customary to detain horses which are from any cause unfit to be removed, in the stables at the wharves until they recover. The importation from Russia consists chiefly of ponies, amongst which strangles, and ordinary catarrh due to cold and exposure, were found to exist."

From our own experience, the presence of one case of pink-eye or one case of strangles is quite sufficient to contaminate any and all places in which such animals may be placed, and to infect hundreds of healthy in-contact animals—or animals which may be placed in stabling where such infected animals have been, that is, unless thorough disinfection has taken place.

With reference to glanders, some valuable suggestions are made as to compensation and the use of mallein as follows :—

"It is quite certain that the law as it at present stands in this country will require to be amended before any reduction will be made in the disease in this country. In some respects glanders is the analogue of pleuro-pneumonia and tuberculosis of cattle. The former of the two latter diseases was at one time much more widely spread and prevalent in this country than glanders is now, and it was eradicated by the Board in the short space of nine years. But the measures adopted for its extinction by the slaughter of diseased and in-contact animals could not be adopted in the case of glanders without very considerable expense; and they would not be necessary if a system could be arranged by which all diseased horses were killed forthwith, and if the owners of those which have reacted to mallein were compelled to prevent reacting horses from coming into contact with healthy horses. A still more effectual mode of procedure would be to slaughter all reacting as well as diseased horses.

"Between the years 1890 and 1898 a sum of about £282,000 was expended in the eradication of pleuro-pneumonia, and the results to the agriculturists and the public have been most advantageous from every point of view. It is not improbable that if an equal or even smaller sum

were placed at the disposal of the Board in the employment of expert veterinarians, and if compensation were given for slaughtered horses, based on the scale of payment to owners of cattle, sheep, and swine, combined with the detention and inspection of foreign horses at the ports, glanders might, like pleuro-pneumonia of cattle, become a disease of the past."

In the report by the Assistant Secretary of the *Animals Division* it is stated that the Board has of late, with the advice of its veterinary officers, endeavoured to induce Local Authorities to adopt cremation experimentally as a means of destroying carcases in suitable instances, and has drawn up the following suggestions on the subject :—

"In instances where the carcase to be dealt with lies near any building, rick of hay, or forage, it must be moved to a spot where a fire can safely be kindled. The distance should be as short as possible. Due regard should be had to the Board's Leaflet on Anthrax, No. 28.

"The process adopted should be as follows :—

"Alongside the carcase cross trenches 9 inches wide and 12 inches deep are dug, the trench parallel with the carcase being 7 feet long, the other being 5 feet long, and at right angles and bisecting the former.

"Four stones about 6 inches thick and about 12 inches square on the surface (a sufficient number of bricks will answer the purpose) are then placed in such a position that the carcase when it has been rolled over and placed on the stones will be about 6 inches clear of the ground, the centre of the trenches being underneath the centre of the carcase. The object of this arrangement is to ensure a sufficient draught for keeping up a fierce combustion of fuel during the process of cremation.

"One ton of wood and 15 cwt. of coal or of coal and coke and two trusses of straw should be provided. The straw is used for ignition, and the wood and coal are carefully built up round the carcase and should be well intermixed. The straw should then be lighted, and in from four to six hours the carcase will have been completely consumed. The addition of paraffin to the materials assists combustion.

"A long pole should be used to clear away the ashes from the trenches and from underneath the carcase."

Further on in this report a suggestion is made at last that *dishorning* is humane, and should, under certain circumstances, be adopted in England, as is done in Scotland and Ireland.

"It is to be observed with satisfaction that a considerable portion of the cattle now brought from Ireland are dishorned in the country of origin, and the sufferings of the animals, both on shipboard and during railway transit, are proportionately decreased. It is a matter for profound regret, both in the interests of the owners and the animals themselves, that the practice of early dishorning is not generally adopted in Great Britain. The operation, when performed at an early age, is practically painless. It is clear that such powerful means of attack and defence as are afforded by long and sharp horns are not needed by animals when in a condition of domestication, whilst their misuse by the more powerful animals causes cruel suffering to their weakly companions, even in the stock-yard. When cattle are conveyed either by sea or by railway the evils attending the presence of horns are enormously increased, and the consequent amount of mischief done is often of a very serious character, even from a merely financial point of view. As was pointed out in a previous report, on all occasions where horned cattle are travelling it may be observed that a few

of the animals in every pen or truck act as the 'bullies' of the party. They appear to attribute their own discomforts to the animals near them, and do their best to retaliate by goring their neighbours, and the more space given them the more injury they do. Even when closely packed these pugnacious animals succeed in keeping all their companions constantly moving, and make the general condition of all more miserable than it otherwise would be. To those persons who have closely watched them during their travels there can be no doubt that a considerable portion of the sufferings of horned cattle is caused by the ill-usuage they inflict on each other. Dishorned cattle seem, with the absence of power, to lose also the inclination to injure their companions, and there can be no question that if the practice of early dishorning were generally adopted throughout the country, more would be done to diminish the sufferings of cattle when travelling by land or sea than by any other means."

SOME NOTES ON REDWATER, &c.[1]

BY MR. J. HEWSON, M.R.C.V.S.

GENTLEMEN—I wish first of all to thank you sincerely for the honour you have conferred upon me in electing me your President for the ensuing year. Your President should have been some one more capable and some one who has done more for the success of this Association than myself, particularly at this time, when we are as one might say passing through a crisis. As your President, I hope you will overlook all my shortcomings and assist me with the good feeling and support that has always been extended to previous occupants of this chair.

One of the first duties expected of a new President is to read an inaugural address, which usually takes the form of a review of current topics and matters of interest to the members. As our meeting to-day takes on somewhat of a social nature, and for other reasons which are obvious, I will be brief in the remarks that I am about to make.

At a time like the present I think that we as a Society cannot do less than express our gratification at the wonderful recovery of His most Gracious Majesty The King from such a serious illness as he has so recently suffered from. Thanks to the aid of modern surgery, assisted by a strong constitution, he has been spared to be crowned King of the greatest Empire the world has ever known, and we sincerely hope that he will long live to reign over us.

With regard to the National Veterinary Association I am sure you will all be pleased to know that they have decided to hold their next meeting in our beautiful lake district, at Windermere, and that they have elected Mr. Garnett to be their President during their visit to the north. I am certain, from our previous experience of him, that they will find Mr. Garnett to be the right man in the right place.

I hope that the Border Counties Association will welcome them in a right hearty manner, and that those of our members who are not already members of the National Association will take immediate steps to become members, and thus avail themselves of the benefit of a visit of the National Veterinary Association to our district.

[1] Presidential Address delivered at the Quarterly Meeting of the Border Counties Veterinary Medical Society at Keswick on 15th August 1902.

As previously stated, this is rather a critical period with our Association, and it is regrettable that some of our meetings recently have been of a somewhat stormy character, but I hope that the proverbial calm will follow, and that the future of this small but useful Society, which up to now has an excellent record, will have a power in the profession always to be considered, and be a benefit to each veterinary surgeon practising in the border counties, and when each meeting will be looked forward to with pleasure as a day of social and professional intercourse. This cannot be done unless members make up their minds to let bygones be bygones and attend the meetings more regularly, infusing into each meeting that enthusiasm which is essential to its success. As is the nature of all things, the membership of this Society is constantly changing, and that from one cause and another. We must look to the younger members for our chief support, and to my way of thinking this can only be done by their attending regularly and taking an active interest in all that is going on, and over and above that to bring before the notice of the different meetings anything of interest which may occur during their daily practice. It is by this means that we gain some useful information regarding many diseases of which, I am sorry to say, even at this present day, we are almost ignorant as to their exact etiology and pathology. It is also of practical interest as showing how certain diseases vary according to locality and circumstances under which they appear; for example, take the disease *Redwater*, which as it appears in some districts seems to be almost a different disease to what we are accustomed to meet with in Cumberland.

At a meeting of the National Veterinary Association held in Edinburgh on July 30th, 1901, Mr. Clark read a paper on "Some Diseases affecting Young Farm Stock." In this paper he included Redwater, and gave his experience of the disease, which is evidently an extensive one. As a result a good discussion followed, in which Mr. Dunstan and several other veterinary surgeons joined. Mr. Dunstan, who I think hails from Cornwall, found that in his experience the disease principally affected milk cows. Then in THE VETERINARY JOURNAL for May 1901 we have a paper on "Redwater," by Mr. Young, in which he gives his experience of the disease as occurring almost exclusively in feeding stock in good condition. Not only do these men differ as to the class of animal mostly affected with Redwater, but they differ as to the cause as well as the supposed pathology, and, needless to say, they differ entirely as to the course of treatment that is necessary. Thus we have Mr. Clark and his adherents describing the disease as affecting young animals and occasionally milk cows in what is known as the parturient form, both of which he attributes to the want of proper food, either as the result of being pastured on poor, bad land, or being supplied with an improper mixture of roots and hay or straw. Then we have Mr. Young describing the disease as occurring almost exclusively amongst stock well fed and in good condition. So much does Mr. Young find this to be the case that he expresses his doubt as to whether the disease ever really exists amongst milk cows. Then, again, we have Mr. Dunstan and many others who find the disease chiefly amongst milk cows, and occasionally amongst young stock. Mr. Dunstan attributes the disease to some change in the feeding, or to some change in the weather, which might alter the nature of the grass or other green food in use at the time.

As regards my own experience of Redwater, I find that 75 per cent. or more of my cases occur among milk cows. The others occur amongst

young stock, and occasionally where they are in good condition. In the cases affecting milk cows they are usually seen when the cows are at grass, but as they mostly belong to milk sellers, they usually receive a feed of Indian meal and grains night and morning. I also notice that cattle when grazing on certain fields at one particular time of the year are very liable to have Redwater; so much so that three of my clients have land which they dare not put their cows on to graze during the months of August and September.

Two years ago I had rather a strange experience with a cowkeeper and his cows. He was new to the district, and rented a certain field in which to graze his cows. They were kept in it almost regularly until the beginning of August, when, owing to the scarcity of grass in this particular field, they were kept out for about three weeks. At the end of that time they were put back to graze in this field, which in the meantime had grown a wonderful crop of grass owing to the showery state of the weather and the rest that it had had. Within a week from the time they were put back the cow-keeper came to my place for some medicine for two of his cows which he said had Redwater. On my suggesting that I should go and have a look at them, he thought that it was hardly necessary as they did not seem to ail very much, only their water was very red. Three days afterwards he came back and told me that some of his other cows were showing signs of Redwater, and I had better go and have a look at them.

I found the two cows which commenced first to be improving, feeding well, urine much clearer, and milk returning. On examining the others, I found three of them to be suffering from Redwater, as indicated by the colour of the urine, with loss of appetite, arrest of the secretion of milk, slight diarrhœa, small quick thrilling pulse, mucous membranes very pale, and the skin round the vulva much puckered. This last symptom was very distinct in all the cases. These cows were put under treatment similar to the others, and the rest of the cows which appeared to be healthy were put into a fresh pasture. I suggested that they should be kept inside and each given a dose of physic, but this he objected to, as he considered that he considered that he would then have no milk for a day or two with which to supply his customers. There were thirteen cows altogether, and in the course of three weeks ten of them had suffered from Redwater in one form or another. Soon after the commencement of the outbreak two of the cows calved, and then took the disease about five or six days after calving. They were by far the worst cases, but I am glad to say that they all made a good recovery.

Treatment.—As soon as they showed any sign of the disease each cow received from ten to twelve ounces common salt along with half an ounce of ginger in a quart of gruel. After that every six hours they received alternately small doses of sodæ chlor. with pot. chlor. and linseed oil, turpentine, and liq. ferri perchlor. until the urine became almost clear. After that they were put on to ordinary tonic medicine. On inquiries I found that this field had long been known for causing Redwater in cattle at certain times of the year.

LAMINITIS.[1]

BY J. W. COE, M.R.C.V.S., STOKE-ON-TRENT.

MR. CHAIRMAN AND GENTLEMEN—I have chosen for the subject of my paper one of the diseases familiar to all of us, namely, laminitis. It is one of some importance to us as practitioners, and I trust that by discussing it here to-day we may benefit by the opinions of others, especially as to its cause and treatment.

It is an acute inflammation of the sensitive laminæ of the horse's foot, and one of the most painful diseases he is heir to. It is occasionally seen in cattle and sheep. Usually it affects the two fore feet, but often all four feet become invaded. It may assume one or more of three forms, namely, acute, subacute, or chronic. They vary chiefly in a question of degree and duration. The acute form is often associated with considerable constitutional disturbance and a high state of fever, and is the one we have most to deal with.

The subacute is a gradual invasion usually of the fore feet, without any acute premonitory symptoms, often seen in animals that have worked hard for long periods on hard roads: this form often merges into the chronic, with gradual structural alteration.

The disease commences as a hyperæmia of the sensitive laminæ, quickly followed by an exudation between the horny and sensitive laminæ. The extremely sensitive laminæ being placed between the horny box and the pedal bone, there is considerable tension owing to the rigidness of the parts, and consequently the pain is acute.

The laminæ, of course, bear a great part of the animal's body weight, and those at the toe being vertical bear more weight than the sloping and nearly parallel laminæ at the posterior part of his foot; consequently the pain is greatest at the toe, and the animal endeavours to relieve this by placing his weight on the posterior part of the foot, or, as it is commonly termed, he goes on his heels. This causes a considerable pull on the attachment of the perforans tendon, and the already loosened pedal bone alters its position, the toe of the bone sinks and its alæ rise, pressure is exerted on the sole by anterior rim of the bone, and the sensitive and horny sole gradually flattens and afterwards assumes a convex form instead of the well-known concavity of the foot. This condition is usually termed dropped sole, pumiced or oyster foot, and may be so bad that the toe of the bone penetrates the horny sole, septic infection is set up, and the gravity of the case increased.

As the disease develops the external shape of the hoof alters, the wall just below the coronet, especially anteriorly, assumes a more perpendicular appearance, while there is a tendency for the toe to elongate. This is owing to the thickening of the white line and exfoliation of the epithelium of the sensitive laminæ, the horny laminæ are not properly secreted, and a cavity at the toe is often found containing débris of broken-down horn cells and epithelium, forming a cheesy mass. Also the horse by travelling on the posterior part of his foot does not wear down the toe, and if the foot is shod there is a tendency to displace the shoe forwards. Rings form on the wall commencing at the coronet, and are close together anteriorly, but they diverge towards the heels, due to the quicker growth of horn there;

[1] Read at a Meeting of Midland Counties Veterinary Medical Association, August 20th, 1902.

these rings are more irregular and numerous than the rings on hoofs resulting from altered nutrition.

Some horses that have suffered from laminitis and, the acute symptoms passed off, exhibit a peculiar gait. They lift their fore feet sometimes higher than usual, and put them down with a kind of swing, the heels coming to the ground first. This is caused by the relaxed condition of the perforans tendon, it being too long, after displacement of the pedal bone, to exert that steadying action on the foot that it does in health.

The exciting cause of the disease is not known, but it is believed to be due to the absorption of some toxic material from a mucous membrane, usually the bronchial, alimentary, or uterine.

The predisposing causes are many and varied. The progeny of certain stallions are said to be liable to the disease, but in my opinion certain conformation of the feet, namely, the low flat feet with weak heels, predisposes to the affection, and it is this predisposition, not the disease, which is hereditary.

Mechanical irritation is responsible for many cases. Continued exertion at high speed until exhaustion ensues is a frequent cause, especially in roadsters, plethoric cobs, and small ponies, when not physically fit; this often occurs in hot weather. Horses noted for their speed and action are liable to it, any rapid and continued work may bring on an attack; travelling stallions at the commencement of the season when in soft condition, horses journeying long distances by train, and also when on shipboard.

Errors in diet cause a large percentage of cases, and they are sometimes termed dietetic laminitis, such as when animals that have got loose in the stable, and gorged themselves with grain at the corn bin, new hay, new oats, wheat, rye, barley, potatoes, large quantities of cold water when in a heated condition, changing from dry to green food or the reverse, any food liable to cause indigestion or engorgement of the stomach. Wheat is perhaps the most dangerous, but flour and water given during journeys in hot weather is often to blame. Most of the foods mentioned appear to be harmless if boiled or cooked.

The disease often follows a debilitated state of the body after an attack of pneumonia, bronchitis, gastro-enteritis, peritonitis, metritis, or superpurgation following the administration of a large dose of aloes. Continuous standing when lame from painful foot affections, the opposite and previously sound foot occasionally becomes affected, and the animal is seen to put all his weight on the lame foot; this is usually a very bad symptom.

Parturient laminitis may follow metritis, but it often supervenes when a shred of placenta has been left in the uterus; it is also said to be caused by decomposition of the lochia. This form of the disease is most frequently characterised by suppuration taking place at the coronets.

During gastro-intestinal disturbance there is a great volume of blood in the abdominal vessels, and the feet may possibly be robbed to a certain extent of their usual supply, and if this is so, it may be that changes occur in the endothelium of the blood-vessels of the feet, which are conducive to the attack of some organism of which we are at present unaware.

The disease appears suddenly as a rule, and is usually noticed in the morning when bringing the horse out of the stable. There is a disinclination to move, and the animal attempts to relieve the pain at the front of his

feet by going on his heels, the fore feet are moved one after the other very rapidly, and he then stops until urged on again, the hind feet are thrust forward under the body to endeavour to support as much weight as possible.

When the hind feet are affected the horse does not thrust them forward so much, but he picks them up suddenly with a jerky kind of action. When all four feet are invaded the case is generally grave and troublesome. On examining the patient the pulse is found to be much accelerated, bounding, and full, it may be as much as 140 per minute. The temperature may register 103 to 107 F. Respirations are hurried, mucous membranes injected, anxious facial expression, patchy sweating of the body, and constipation. The horse when turned round will sometimes groan and stumble badly, but if he can be got to move a few yards the circulation of the feet improves, and he goes better. This is often seen when horses are taken ill on a journey; after stopping a short time they exhibit symptoms of pain in their feet but after being urged on a short distance they improve, and in some cases the attack passes off completely. This does not always happen; occasionally the reverse takes place and the trouble is aggravated.

On examination of the feet they are found to be hot, and there may be slight swelling at the coronets. Throbbing of the plantar and tracheal arteries can be felt. Pain is shown when the feet are tapped with a hammer or pinched with the farrier's pincers, especially at the toe. Constipation is often marked in the early stages of the affection, and in some very acute cases the animal lies persistently and will not rise unless made to do so. These patients often allow the bladder to become very distended rather than suffer the pain caused by putting themselves in position for micturition.

In considering the treatment of this disease the acute form calls for active and immediate attention, and if the early stages are allowed to be neglected a permanent and complete recovery is impossible. Phlebotomy has always had its supporters, and apparently justified them. The circumflex vessels of the toe, the coronary plexus, the brachial vein and jugular, are each situations for the abstraction of blood, which have their followers. Personally I prefer the jugular, and always fear the chance of septic infection when the operation is performed on the feet.

Many practitioners give a purgative in the form of a physic ball, but I think that in cases with a high temperature small and repeated doses of salines, or oleaginous drinks and fluid food, such as bran tea, hay tea, or cooked linseed, together with the use of enemas until the bowels respond, is indicated instead of cathartics and purgatives.

Subcutaneous injections of pilocarpine in 1 gr. doses or subcutaneous injections of arecoline in ½ gr. doses are to be highly recommended, and in many cases give good results.

Arecoline increases peristalsis and so relieves the nearly always present constipation, and you avoid the nauseating and depressing effects of aloes. It should be repeated once daily for four or five days, care being taken to regulate the dose according to the size of the patient. This drug is said by some to favour the absorption of the exudate. Pain should be combated by small repeated doses of chloral or subcutaneous injections of morphia; the temperature reduced by salicylate of soda and quinine. The shoes should be removed carefully, not violently wrenched off by the

smith as is sometimes done, the toes shortened and the crust lowered, the soles and heels being left to bear weight. The feet may then be placed in large cold bran poultices frequently renewed. A stimulating liniment may be applied to the coronets and up the course of the principal blood-vessels of the leg. Some practitioners prefer hot poultices, as they are said to soften the hoof and relieve the pain and tension more than cold. I think myself that cold is indicated, and have on several occasions obtained most gratifying results from surrounding the feet with crushed ice. If the pain is not too acute or the case has not progressed beyond the congestive stage, exercising the patient on soft ground or in his poultices for fifteen or twenty minutes at a time, three or four times a day, has a most beneficial effect. This can be easily understood when we consider the physiology and anatomy of the foot; but in the very acute stage, or when structural changes are taking place, I believe exercise to be contra-indicated.

Some horses when first affected with the disease persistently refuse to lie down; these should be carefully cast on a soft bed in the box, either by strapping up one fore leg and then pulling the head gently round to the opposite side, or the casting rope may be put on and the patient gradually forced down. When this has been done a few times the relief from the pain experienced while in a standing position soon teaches them the benefit of lying.

In the very acute cases where there is much distress subcutaneous injections of cocaine over the course of the plantar nerves gives temporary relief, and allows an animal worn out with pain to take food and get a little sleep. Care should be taken not to give an overdose, and only two legs at a time should be injected. I think in these very painful cases, and especially where no improvement has taken place for four or five days, it is permissible to operate and incise the plantar nerves but not to excise any, the operation only being performed with the idea of getting rid of the acute pain and allowing the patient to rest.

In *The Veterinary Record* of April 19th, 1902, Vet.-Lieut.-Colonel Nunn mentions an operation for laminitis, namely, ligature of one of the digital arteries, as suitable for the acute and chronic forms of the disease. It is recommended chiefly for the chronic form, and is performed, of course under strict antiseptic precautions, at the seat of high neurectomy, the artery is sought for and cut down upon, ligatured in two places and divided between them. It is easy to understand that for some time the supply of blood to the foot would be considerably lessened, and I should say with good effects.

Vet.-Lieut.-Colonel F. Smith, in a paper read before the National Veterinary Association, some years ago recommended sawing through the wall in those very bad cases which do not respond to the usual treatment, and after the third, fourth, or fifth day, if no improvement has taken place, he cuts through the wall from coronet to ground surface in three places in each hoof, one incision directly in front and another on each side of it, the separated portion of horn between the incisions to be completely divided from the sole and the ground surface of the divided portion to be lowered with the rasp so as not to bear any weight. The patient to be afterwards shod and exercised. This operation is performed with the idea of relieving tension and allowing fluid to drain off.

After we have subdued the acute symptoms it is good practice to apply rocker shoes to the fore feet, or the ring shoe advocated many years ago

by the late Mr. Broad, of Bath, vesicate the coronets, and either carefully exercise the patient and stand him in wet clay, foot or mud baths, or else turn him out in damp low-lying ground. When this is done I consider he ought to be seen by the veterinary attendant much oftener than he usually is, and have the toes of his feet shortened and kept in a good shape, otherwise malformed hoofs are the result.

As soon as the horse can bear it, I take off the shoes and let the animal go a few weeks barefooted on the soft ground and I have found great benefit from this where structural change has taken place and the pedal bone descended.

When the horse is brought up from grass I have him shod with wide webbed shoes, but not seated out any more than necessary, except at the toe, and if he can stand the shoe fitted on to his sole a little I think it is a good thing to do so. Of course many cases come up with the sole very thin and sensitive, these have to be shod with the seated ring shoe, but I have come to the conclusion that the more you seat out the shoe at the commencement the more it becomes necessary as time goes on, and there is always a great tendency for the wall to spread outwards and break away. Leather soles or rubber pads are of great use in preventing bruising the sole with stones, &c., when putting the horse to work.

The treatment of the subacute form of the disease is generally unsuccessful, the animals rarely being fit to travel fast on paving or hard roads. Neurectomy answers for a time, especially if the patient is put to only easy or slow work, but this is not advisable in many cases.

The treatment of the chronic form as time goes on resolves itself into a question of good shoeing and preservation of the crust.

The treatment of parturient laminitis does not vary a great deal from the ordinary affection, as far as the feet themselves are concerned, but considering that the poison is probably absorbed from the uterine mucous membrane, it is of course necessary to frequently irrigate the uterus with some mild and non-irritating antiseptic, such as buric acid or chinosol. The organ should be carefully examined for any shreds of decomposing placenta. If suppuration occurs at the coronets they should have all loose horn removed and dress often with an antiseptic, at the same time keeping up the animal's general health by easily digestible but nutritious food.

Laminitis in bovines usually assumes more of the chronic form without much structural change. Cold poultices, vesicating the coronets, and exercise often give good results.

EXTRACTS FROM OBSERVATIONS ON THE ORIGIN AND OCCURRENCE OF CELLS WITH EOSINOPHILE GRANULATIONS IN NORMAL AND PATHOLOGICAL TISSUE.

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HISTOGENESIS OF EOSINOPHILIC CELLS.

There are several theories in regard to the histogenesis of eosinophilic cells and in support of each theory a certain amount of evidence has been brought forward. These theories and their main supporters are as follows:

I. From polymorphonuclear neutrophilic leucocytes by a kind of ripening process, Max Schultze,[1] Gulland,[2] Zappert,[3] Brown,[4] and others.

II. From eosinophilic myelocytes in the bone-marrow only, Ehrlich.[5]

III. Division of pre-existing cells of the same kind, by mitosis, Muller und Rieder,[6] and Van der Stricht;[7] by amitosis, Rénaut,[8] Denys,[9] and Arnold; Gulland,[10] who has exhaustively studied the leucocytes of many species of animals, thinks that all forms of leucocytes give rise on division to lymphocytes, but that occasionally on the division of eosinophiles the daughter-cells may contain a few eosinophilic granulations.

IV. From the connective-tissue of various parts of the body, Gollasch,[11] Neusser,[12] Weiss,[13] and others. Kanthack and Hardy[14] found these cells in numbers in the cælomic cavity and connective-tissues of animals.

V. Occurring as incompletely developed erythrocytes, derived from hæmatoblasts, Przewaski.[15]

VI. From the engulfing of hæmoglobin of hæmatoblasts by leucoytes, Sacharoff,[16] who thinks that the granules are connected with the dispersion of hæmatin and the intense coloration of eosinophilic granulations is due to the greater thickness of their iron-bearing paranuclein. According to Sacharoff, bacteria taken up by leucocytes may furnish eosinophilic material, their nuclein being changed into eosinophilic paranuclein. Klein[17] thinks that eosinophiles are formed from other leucocytes by the taking up of iron derived from red blood cells.

VII. From lymphocytes by transition, Pappenheim.[18]

It is neither impossible nor indeed improbable that these cells may have their origin in any of these several ways.

Ehrlic and Lazarus strongly combat the idea of the local formation of eosinophiles.

While not denying that these cells may have their origin in many ways, in the study of our rather large material, we have never been able to trace any one of these modes of origin (except from eosinophilic myelocytes). We have been struck on the other hand with the great frequency with which the origin of these cells can be traced from the hyaline leucocyte, and especially from the plasma cell. In case after case, in organ after organ, and especially in the lymphoid tissues (the thymus, lymph glands, the spleen, and the bone-marrow), in the gastro-intestinal mucosa (gastritis, lympho-sarcoma, colitis, and appendicitis), in exudations rich in lympho-

[1] Schultze, Max. Arch. f. Mikroskop. Anat. 1865, I.
[2] Gulland. Journal of Physiology, 1895-6, Vol. xix.
[3] Zappert. Zeitschrift f. Klim. Med. 1893, Bd. xxiii.
[4] Brown. *Loc. cit.*
[5] Ehrlich and Lazarus. Die Anemie. Wein, 1898.
[6] Müller und Rieder. Deutsch. Arch. f. Klim. Med., 1891-2, Vol. xlviii.
[7] Van der Stricht. Quoted by Brown, *loc. cit.*
[8] Rénaut. Quoted by Brown, *loc. cit.*
[9] Denys. Quoted by Brown, *loc. cit.*
[10] Gulland. *Loc. cit.*
[11] Gollasch. Fortschritte d. Med., 1899, Bd. vii.
[12] Neusser. Wien. klin. Wochenschr., 1892, Bd. xli., p. 64.
[13] Weiss. Quoted by Brown, also by H. F. Müller. Centralbl. f. allgem. Path. u. path. Anatomie.
[14] Kanthack and Hardy. Journal of Physiology, 1894-5, Vol. xvii.
[15] Przewaski. Centralbl. f. allg. Path. und path. Anat. 1896, Bd. vii.. S. 177.
[16] Sacharoff. Centralbl. f. Bakteriologie, 1897, Bd. xxi., S. 265.
[17] Klein, S. Centralbl. f. Innere Med., 1899, Bd. L. S. 28.
[18] Pappenheim. Virchow's Archiv, 1899, Bd. 157, p. 71.

cytes, hyaline leucocytes and plasma cells (acute and chronic nephritis, salpingitis and ovarian abscess, &c.) and in various other processes, we have observed the transition of both these varieties of cells into eosinophiles.

As already pointed out, the hyaline, or better, as Kanthack and Hardy aptly term it, the "ground glass" cytoplasm of the hyaline cell or the plasma cell (for the latter often comes from the former) stains more deeply with eosin than its neighbours. In other cells with clear nuclei, which are often eccentric, there are fine granules which stain deeply with eosin. Other cells with similar nuclei have more coarsely granular and others still very coarsely granular cytoplasm. With the development of the eosinophilic granules the cells usually, but by no means always, increase in size. With the development of the granules the nuclei become less vesicular, and the nuclear chromatin more diffuse. Many coarsely granular as well as finely granular mononuclear eosinophiles were seen, but always a large proportion of the mononuclear cells develop polymorphous nuclei. We have been struck with the large proportion of mononuclear eosinophiles present in some cases. If the idea of Gulland and others that the change in the shape of the nucleus of the leucocyte is dependent largely upon the motion of the cell is correct, the above fact is another argument in favour of the origin of eosinophiles from plasma cells. In size the eosinophile in the tissues varies within rather wide limits, from the size of a small plasma cell, scarcely larger than a lymphocyte, to that of the typical eosinophile of the blood.[1]

In Case XX. we observed appearances which we cannot interpret otherwise than that they represent the development of coarsely granular eosinophiles from smooth muscle cells. In the same case there were also many examples of the plasma cell origin of these cells.

CHARACTER OF EOSINOPHILIC GRANULATIONS.

We have nothing to add to the knowledge of the character and composition of these granules. For the literature of the subject the reader is referred to Brown's recent article in the *Journal of Experimental Medicine* (*loc. cit.*).

First mistaken for fat, which was disproved by Ehrlich,[2] who first suggested that they represented a nutritive reserve formed by the cell, these granules have been considered in turn non-proteid (Schwarze);[3] proteid (Zappert);[4] hæmoglobin or its derivatives (Przewaski[5] and others); nucleo-albumin (Sherrington);[6] and secretory granules of a defensive nature (Hankin),[7] Kanthack and Hardy.[8] Gulland,[9] however, insists that they are not products of the metabolic activity of the cell imbedded in

[1] A good description with a full account of the plasma cell will be found in Councilman's article on Acute Interstital Nephritis, Journal of Experimental Medicine, 1898, vol. iii. p. 393. See also Marschalko's Zur Plasmazellenfrage, Centralbl. f. Allgem. Pathologie und path. Anatomie. 1899. Bd. x, S. 851.

[2] Ehrlich. *Loc. cit.* S. 86, and in other writings.

[3] Schwarze. Ueber eosinophile Zellen. Inaug. Diss. Berlin, 1880.

[4] Zappert. *Loc. cit.*

[5] Przewaski. *Loc. cit.*

[6] Sherrington. Proceed. Royal. Soc. Lond., 2894, vol. iv. Also quoted by Brown.

[7] Hankin. Centralbl. f. Bakteriologie, 1892, Bd. xi.

[8] Kanthack and Hardy. *Loc. cit.*

[9] Gulland. *Loc. cit.*

the protoplasm, but that they represent an altered condition of the microsomes, form a part of the cytomitoma, and are therefore plastic and not paraplastic, as is generally believed. Gulland thinks that they are concerned in the amœboid activity of the cell. As previously stated, we were unable to demonstrate the presence of iron in the granules of eosinophiles in hardened tissues.

PRESENCE OF EOSINOPHILES IN NORMAL ORGANS.

Beside the blood, coarsely granular eosinophiles are normally found in various tissues of the human body, the spleen, thymus (earliest mention probably by J. Schaffer [1]), the lymph glands, bone-marrow, the gastro-intestinal tract (especially the stroma of the mucosa), in the kidneys and liver, and in various connective tissues. They are found in the same locations in various lower animals. They form from 25 to 40 per cent. of the wandering cells in the peritoneal cavity in the guinea-pig, and from 30 to 50 per cent. in rabbits (Kanthack and Hardy). In these animals they are also numerous in the subcutaneous tissue. We have found these cells but rarely in apparently normal organs of adults—in ten cases in the appendix, once in the Fallopian tube, and once in the gastro-intestinal mucosa.[2] Heidenhaim found them constantly present in the intestinal mucosa of dogs, in which their numbers were greatly increased after fasting and a dose of magnesium sulphate. Eosinophiles were not uncommonly found in various organs in children dying both with and without septicæmia. We have also been able to confirm the observations of those who have described eosinophiles in numbers in the blood and tissues of the fœtus.

PRESENCE OF EOSINOPHILES IN INFLAMMATORY AND OTHER LESIONS.

With a few notable exceptions coarsely granular eosinophiles have not been described in inflammatory reactions and in infectious granulomata. They have been found in gonorrhœal pus in numbers by Gollasch [3] and others, in the sputum in bronchial asthma by Gollasch,[4] Leyden,[5] and others, in the sputum in bronchitis by Leyden,[6] Teichmüller, Grünwald,[7] and others; in the skin in lymphoderma perniciosa by Weiss,[8] and in leprosy by Jadassohn;[9] in the blisters of pemphigus by Neusser[10] and others; in Dühring's disease by Leredde and Perrin;[11] in blisters produced artificially by Bettman[12] and by Kanthack and Hardy; in hæmorrhagic pleurisy by Klein[13] and Harmasen.[14] Gronven[15] found eosinophiles

[1] Schaffer J. Centralbl. f. d. Med. Wissensch., 1891, nos. 22 u. 23.

[2] On further study we find eosinophiles constantly present in the stroma of the mucosa and often in the lymphoid tissue of both the normal and inflamed appendia.

[3] Gollasch. *Loc. cit.*.

[4] Gollasch. *Loc. cit.*

[5] Leyden. Deutsch Med. Wochenschr., 1891, Bd. xvii., S. 1085.

[6] Leyden. *Loc. cit.*

[7] Grünwald. Virchow's Archiv, 1899. Bd. 158, S. 289.

[8] Weiss, Jul. Jahrb. f. Kinderheilkunde, N. F. Bd. 35, quoted bv H. F. Müller, Centrabl. f. allg. Path. u. path. Anat., 1893, Bd. iv. S. 539.

[9] Jadassohn. Verhandl. d. deutsch. dermat. Gesellsch. ii. u. iii., quoted by H. F. Müller, *loc. cit.*

[10] Neusser. Wiener Med. Wochenschr., 1892, 5 Jahr., S. 41.

[11] Derrede und Perrin. Ann. de dermat. et Syph., iii. ser. Tome vi., p. 281.

[12] Bettman. Münchener Med. Wochenschr., 1898, no. 39.

[13] Klein. *Loc. cit.*

[14] Harmasen. Quoted by Klein.

[15] Gronven. Inaug. Dissertation, Bonn, 1895.

in the false membrane of diphtheria in two cases, in pneumonia in diphtheria in one case, in a tumour of the larynx and in the bronchial glands in two cases. Przewaski [1] found large numbers of eosinophiles in carcinoma of the cervix uteri in four cases, while Fledbausch [2] observed them in variable numbers in epitheliomata, carcinomata, and lymphosarcomata. They were most numerous about inflammatory and necrotic areas. Grünwald [3] observed coarsely granular eosinophiles in the sputum in one case each of asthma, fetid bronchitis, and phthisis, and in four nasal polyps. They were absent in pneumonia, pleurisy, pericarditis, gonorrhœa, abscess of the breast and the ear, and in chancre. Grünwald describes cells with fine scattered granules which are eosinophilitic to a lesser degree than those of the ordinary eosinophiles, and to these cells which he found in numbers in sputum and other discharges he gives the name "hypoeosinophiles." T. R. Brown [4] and one of us (Howard [5]) found large numbers of eosinophiles in the reaction about trichinæ in human muscle. In our material derived from operation eosinophiles occurred in 13·09 per cent. of the cases, of which over 74 per cent. were inflammatory, and including the cases of syphilis and tuberculosis 83·8 per cent. were infectious processes.

To recapitulate: We have found both mono- and polymorphonuclear eosinophiles in the gastro-intestinal tract, the spleen, thymus, appendix and Fallopian tubes in apparently normal organs, and in the following pathological conditions: abscess of Bartholin's gland, angioma of the liver, appendicitis, in carcinomata of the arm, the bladder, and of the uterus and scrotum, in corpus luteum cysts, in chronic cystitis, in dysentery, in endometritis, in epithelioma of the vagina, face, and of lymph glands, in atrophic gastritis and arsenical gastritis, in interstitial spletitis, in gonorrhœal lymphadenitis, in lymphosarcoma, in nasal polyps, in acute and chronic interstitial nephritis, in suppurative nephritis, in omentitis, in pelvic abscesses, and in a pilonidal abscess, in oophoritis and peri-oophoritis, in lobar pneumonia, in proctitis, in acute and chronic salpingitis, in trichinosis, in the spleen in malaria, and in tuberculosis of the muscles, of the skin and of the lungs, bone, ureter, and lymph glands, and in syphilis of the skin.

We have failed after careful search to find them in organising blood-clots, hæmorrhages into tissue, hæmorrhagic infarcts, organising thrombi of the heart and blood-vessels, organising corpora lutea, and a number of cases of abortion remnants containing blood.

MODES OF DEVELOPMENT AND CAUSES OF INCREASE IN THE NUMBER OF EOSINOPHILES IN THE BLOOD.

In the light of our present knowledge it is clear that these occur in at least two ways:—(*a*) When an abnormally large number of eosinophiles are needed in a particular part of the body,—*i.e.*, when substances possessing positive chemotaxis for these cells are present in a part they are drawn from the hæmatopoietic organs, and reach the part by means of the lymph and blood channels; thus appearing in the blood in increased numbers. (*b*) When under proper stimulation numbers of eosinophiles have been formed in a part, and after the need for them is past, and for other reasons

[1] Prrewaski. *Loc. cit.*
[2] Fledbausca. Virchow's Archiv, 1900. Bd, 161.
[3] Grünwald. *Loc. cit.*
[4] Brown, T. R. *Loc. cit.*
[5] Howard. *Loc. cit.*

not yet understood, they make their way into the lymph and blood-vessels, producing eosinophilia.

A third explanation, one for which, however, there does not seem to be any positive evidence, is that circulatory eosiniphilia may develop by the transition of certain forms of leucocytes into eosinophiles in the circulating blood. *A priori*, there is no reason against this mode of origin. If these cells develop from other leucocytes (hyaline cells, plasma cells, lymphocytes, and polymorphonuclear neutrophiles) in the tissues, why not in the blood as well?

In our cases (consult Groups II. and III.), especially the inflammatory cases, two sources for the eosinophiles in the lesions were demonstrated,—*i.e.*, the blood-vessels, and transition from plasma cells and hyaline leucocytes in the lesions. In many cases two processes could be traced In the same lesion.

Kanthack and Hardy[1] have shown that these cells are the first to wander into capillary tubes, and into Ziegler's plates containing bacteria and other irritants in the peritoneal cavity and subcutaneous tissues of rabbits and other animals. They also showed that these cells are formed or accumulate very rapidly in the connective tissues of animals after injury. We found the eosinophiles the most numerous cells present in multiple renal abscesses occurring in a rabbit after inoculation with *Staphylococcus aureus*. T. R. Brown and Klein are among the authors who have brought out the fact that eosinophiles are formed in the lesions. Klein thinks that polymorphonuclear neutrophilic leucocytes attracted to a place and left to their fate become eosinophiles.

Leredde[2] believes that the pemphigus foliaceus is due to the excretion of eosinophiles by the skin, and concludes that the skin affection is a secondary matter. He regards the affection as essentially one of the blood due to the reaction of the hæmatopoietic organs, especially the bone-marrow, under the influence of multiple intoxications. This conception is quite the opposite of Neusser's view. It is difficult to conceive of the *excretion* of eosinophiles by the skin. It is much more in accordance with our knowledge to think that these cells are attracted to the foci of disease, the hæmatopoietic organs being stimulated to their production, or that they were formed in the lesions.

Our own conception is that in many conditions the formation of eosinophiles in the regular hæmatopoietic centres is stimulated by a variety of substances, many of which also have the property of attracting these cells. In other conditions other forms of leucocytes, but especially hyaline leucocytes and plasma cells and possibly certain tissue cells, develop eosinophilic granulations in various lesions. We have evidence that these two processes may occur together in the same case.

Why are eosinophiles attracted to or formed in inflamed areas and in other lesions?

Müller[3] thinks it will be found that both asthma and pemphigus are caused by circumstances (bacterial?) which have a positive chemotaxis for eosinophiles, while Neusser[4] believes that eosinophiles may be derived from the tissue cells on stimulation of the sympathetic nerves, in the same

[1] Kanthack and Hardy. *Loc. cit.*
[2] Leredde. Ann. de dermat. et Syph. III. n. ser. Tome x, p. 355.
[3] Muller, H. F. *Loc. cit.*
[4] Neusser. *Loc. cit.*

way that granules are secreted in the mucous cells of the salivary glands of the dog after stimulation of the sympathetic nerve of the gland. According to this view the bronchial mucous membranes in asthma and the skin in pemphigus play the part of blood-forming organs in secreting eosinophilic granulations.

Goldman,[1] Jadassohn,[2] H. F. Müller,[3] hold that there are certain substances which possess a positive chemotaxis for eosinphiles. Ehrlich and Lazarus,[4] adopting this view, state that this property is possessed chiefly by the products of the degeneration of epithelial and epithelioid cells. In this way they explain the common occurrence of eosinophilia in skin diseases, in atrophic lesions of the gastric, intestinal, and bronchial mucous membranes, in the neighbourhood of carcinoma and in lupus after tuberculin injection. They think that the mucin or mucin-like bodies in mucous polyps of the nares, must attract these cells.

For most forms of eosinophilia the direct cause, according to these authors, is to be sought for in tissue destruction and its products. They also suggest that the eosinophilia of the various forms of helminthiasis is due to the positive chemotaxis exerted on these cells by poison secreted by the parasites.

As we have already stated, Kanthack and Hardy observed that various substances, including silver nitrate, turpentine, and copper, *B. ramosus*, *B. choleræ*, *B. pyocyaneus*, and *B. anthracis* in animals and liquor epipoeticus upon the human arm, all possessed a strong chemotaxis for eosinophiles. In our operative material bacteriological examinations were negative in many cases, especially in salpingitis and ovarian abscess. In some of these cases a more or less clear history of gonorrhœa was obtained. Taking the operative and autopsy material together, the following varieties of bacteria were found in processes marked by the presence of eosinophiles :—*Streptococcus pyogenes*, *Staphylococcus pyogenes aureus* and *albus*, *Gonococcus*, *Pneumococcus*, *B. coli communis*, *B. mucosus capsulatus*, *B. aërogenes capsulatus* (once in the kidney), *B. tuberculosis*. To these may be added the two cases of infection with animal parasites, malaria and trichinosis.

In the autopsy series the *Streptococcus* was the organism most frequently found.

That coarsely granular eosinophiles play an important part in many inflammatory and a variety of other processes, is shown by the cases reported in this article as well as by the experiences of other observers. Our experience agrees with that of Metschnikoff[5] and Kanthack and Hardy, who state that these cells never act as phagocytes. We have never seen them near bacteria, but have found them in great numbers about trichinæ, without, however, ever invading the cysts.

We have not been able to confirm the statement of Kanthack and Hardy, that these cells apply themselves to bacteria in exudations, and use up their granules in fighting them.

SUMMARY.

In the routine examination of 825 specimens removed by operation,

[1] Goldman. Centralbl. f. allgem. Path. u. path. Anat. 1893, Bd. iii. S. 665.
[2] Jadassohn. *Loc. cit.*
[3] Müller, H. F. *Loc. cit.*
[4] Ehrlich u. Lazarus. *Loc. cit.* S. 113 and 114.
[5] Metschnikoff. Pathologie comparee de l'Inflammation p. 136.

coarsely granular eosinophiles were found in the normal appendix in 10 cases, and in the normal Fallopian tube in one case.

These cells occurred in larger or smaller numbers in the tissues or blood-vessels, or both, in 108 cases, or in 13.09 per cent.; 83.3 per cent. of these lesions were infectious in origin.

In seven cases (one adult and the rest children), four of which died of infectious processes, eosinophiles were present in apparently normal organs.

In 120 consecutive autopsies 27 cases showed larger or smaller numbers of eosinophiles in various organs showing pathological changes. In this series they occurred in the spleen in chronic interstitial splenitis in 11 cases, in the thymus in 5 cases, in lymph glands in 3 cases, in the stomach in 3 cases, in the intestine in 2 cases, in the kidney in 5 cases, in the lungs in 3 cases, in the liver in 3 cases, in the heart in 1 case, in the skeletal muscles in trichinosis in 1 case.

In some cases these cells were brought to the part by the blood-vessels, and in others they were formed in the lesions, while in still other cases their presence was to be accounted for in both of these ways.

In a large number of cases the development of coarsely granular eosinophiles was traced from plasma cells, and in some cases from hyaline leucocytes.

Clinical Paper.

CHOKING IN THE HORSE.

BY W. R. DAVIS, M.R.C.V.S., ENFIELD.

On a Sunday morning recently a black cob, the property of a greengrocer, was brought for treatment. The cob had been turned out in a field adjoining the stable the night before, and was then all right, but on going to bring him up in the morning he was found to be standing in a corner of the field with the back arched, saliva dribbling from the mouth, and very uneasy. On palpating the neck the cob poked out his nose, straightening the head on the neck, which was at the same time lowered, and attempts at vomiting were made. A good deal of mucus was discharged from the nostrils and a quantity of saliva and mucus from the mouth. The pulse and respirations were much accelerated. I found on inquiry from the attendant that a lot of spoilt vegetables, including potatoes, were thrown into the field, and I at once concluded that the cob was choked with a potato, the site probably being in the thoracic portion of the œsophagus. as nothing could be found in the explorable portion of the tube. A little oil was given, and this was promptly rejected through the nostrils. An attempt was then made to pass the probang, but the cob was a most refractory patient, and as I had not enough help to cast him I determined to try an intravenous injection of pilocarpine, which I have several times used in cattle for choking with good results. One and a quarter grains of nitrate of pilocarpine dissolved in 75 minims of water was injected into the jugular. In quarter of an hour the cob was very uneasy, there was a good deal of sweating, fæces were passed twice, and large quantities of saliva fell from the mouth. After the lapse of another half hour the patient seemed easier and took a few swallows of water, and was then given a little hay, which he greedily devoured. He was kept tied up for four hours, and then took a bran mash and some hay, and has been well ever since.

Extracts.

NOTES ON OBSTETRICS.

Communicated to the Central Veterinary Medical Society of France, by M. JEON BEDEL, of Dozule, Calvados.

Early Puberty.—The author was called to a case of parturition in a heifer fifteen months old, covered when she was six months by a bull of the same age. He has also attended a cow in which the mother was fourteen months old. He saw a sign of œstrum in an animal of four months, and the owner informed him that he had observed the same three weeks previously. He has seen a sow three months take a boar the same age.

Late Fecundation.—A mare twenty-four years old was suckling her twenty-first foal. A cow the same age had her twenty-first calf. She was dried and fattened, during which time she came in œstrum.

The Udder.—The existence of supernumerary teats on the posterior part of the udder has often been reported, but the author has seen them on both right and left sides between the two normal ones, but of some cases they were small and badly developed, and in time they were nearly of the normal size. In one of them there were four supernumerary teats, three on the posterior face of the udder and one between the two normal ones. M. Bedel states that this abnormality is much more common amongst Norman cattle than any other breed, and in one instance he has seen seven small supernumerary teats. M. Cagny remarks that he has seen one or even two in colts. The author further remarks that a small quantity of milk is sometimes given from these teats.

Diagnosis of Gestation.—Fœtal movements in the calf, according to the author, cannot be detected before the fifth or sixth month. He terms movement communicated by pressure on the right flank of the cows abdominal fluctuation, "Ballottement Abdominal," and that by the rectum rectal fluctuation, "Ballottement Rectal." He mentions that in a cow eight months in calf he obtained negative results by rectal and positive by abdominal fluctuation. He points out that care must be taken not to mistake the resistance given by one of the *culs de sac* of the rumen for the gravid uterus.

Fœtal Heart Sounds.—M. Bedel remarks that in the cow even at the eighth month they cannot be heard. This statement is contrary to that of other observers, amongst whom are M. Moussu, who states that by this means it is even possible to tell in what position the fœtus will be presented. M. Moussu also remarks that certain conditions of the mother, such as pulmonary congestion, enteritis, or even bleeding, will intensify the fœtal heart sounds.

Length of Gestation.—Amongst 50 Normandy cows the average was 284 days,—viz., 285 for bull and 283 heifer calves. The longest time 300 and shortest 229 days. The length of time seemed to increase with each pregnancy. With primapara the average was 280 days, second calf 282, third 283, and with subsequent up to the tenth 286.

Twins.—The period of gestation is short, and according to M. Bedel there is generally difficulty in parturition. He mentions a cow that in 1900 calved naturally after 286 days, in 1901 went with twins 276 and had

a difficult parturition, another in 1900 went 280 days and calved without difficulty, but in 1901 went 270 with twins and required assistance.

Furthermore, a cow whose mother had given birth several times to twins had a single calf the first time, twins the second. M. Moussu thinks this is hereditary.

A case is mentioned of a cow going for seventeen months when a mummified fœtus was removed.

The fœtal membranes are said to be expelled almost at once in the mare, but out of nineteen cases observed in the cow from the third to the fifth hour.

(*Bulletin de la Société Central de Médicine Vetérinaire*, July 24, 1902.)

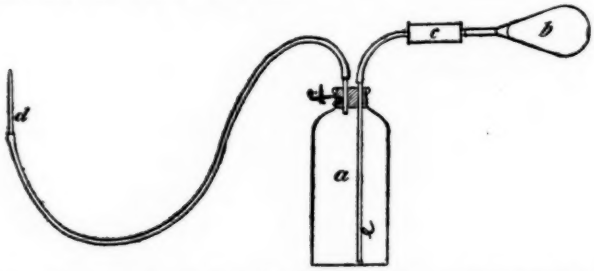
JOSHUA A. NUNN, F.R.C.V.S.

ON THE TREATMENT OF MILK FEVER IN CATTLE.

VETERINARY-SURGEON J. SCHMIDT, in an address delivered at the "Nordisk Dyrlogemöde" in Copenhagen in June of this year (1902), reviewed the development of the treatment of this disease within the last five years. After giving a number of statistics he went very fully into the modern treatment with potassium iodide and air. He is in favour of a still larger quantity of pumped air, which, he says, especially in connection with a dose of caffeine, gives excellent results. Surgeons must not, he says, lose their confidence in the local and general antitoxic effects of potassium iodide, and, he further states, a combination of potassium iodide with an *abundant quantity of air* will certainly give, in an average of cases, even more satisfactory results. A solution of potassium iodide will immediately mix with the milk in the udder and thereafter in thinner form penetrate quickly into all easily accessible alveoli. As a portion of these, especially in the undermost part of the udder, are exposed, when the cow lies, to great pressure, and may thereby be shut off from the glandular passages, we must resort to the severe and yet not always satisfactory treatment by massage in order to get the solution into all the alveoli if possible. This work may be lightened and very much facilitated if a fairly large quantity of air be pumped in after the potassium iodide. This can be accomplished easily when the patient is lying, but if she stands we must massage the udder after the injection, and only then pump in the air, otherwise a portion of the air will rise above the solution. From the alveoli a portion of the solution will penetrate immediately through the epithelial layer, and, in the process of absorption by the milk-secreting apparatus, exercise a *local* antitoxic effect. Thereafter the solution is taken up by the circulation, in which, doubtless, it exercises a *general* antitoxic effect. Experiments with intravenous injections of potassium iodide have been successful in this direction, and a general influence is here and there shown, especially when the organism is overloaded with poisonous digestive products from the alimentary canal or products from the uterus.

Mr. Schmidt uses the double method, first a solution sent through every teat, of a quarter of a litre of a ·7 to 1 per cent solution of potassium iodide without admixture of air, *and then* the air-pump. The same instrument will serve for both as the funnel may be removed after the potassium

iodide has been injected and a blowing apparatus put in its place. The following diagram explains the process :—



(*a*) Bottle holding one litre of potassium iodide solution. (*b*) India-rubber ball with two valves. (*c*) Cotton-wool filter. (*d*) Milk catheter. (*e*) Long glass tube. (*f*) Short glass tube.

Mr. Schmidt generally brings the solution in a separate bottle, but if only one bottle is used an extra cork quite air-tight must be used. Before application the teats and the neighbouring part of the udder must be carefully soaped, then a clean handkerchief laid under the udder, then the teats disinfected, and at the same time the handkerchief moistened with the disinfecting fluid. The bottle ought to be held by an assistant whilst the catheter, previously disinfected, is introduced into one of the teats. Then the operator himself takes the bottle, turns it with the cork downwards, and works a quarter litre of the solution into the udder. When this is finished the operator turns the bottle with the cork upwards, pushes it under his left arm in order to keep his left hand free to prevent the india-rubber tube from bending too sharply, then with his right hand he pumps air through the filter and thence through the solution into the udder until a quarter of it is widely distended. Before withdrawing the milk-catheter from one teat in order to fix it into another it is advisable to massage the udder a little, otherwise, in the case of light-milking cows, a portion of the pumped air might immediately rush out again from the teat.

Where there is danger of heart-injury we may add to the potassium iodide 5 grammes caffeine sodii salicylati, and should it be found necessary in any particular case to repeat the treatment we may use a pure infusion of caffeine along with the air-pumping. Sodium salicylate of caffeine gives along with potassium iodide a clear solution and has no injurious effect on the udder; with the help of a dose of caffeine we may hope to save many a patient. Then solutions of common salt are still frequently used in the rectum, and may for various reasons continue to be used. It may be regarded as proved that in the course of the disease a great absorption of "corporeal sap" goes on in the peripheral parts of the body. After introduction of a solution of common salt, therefore, this (the solution) will be partly absorbed instead of the excretory fluid charged with digestive products. We reach thereby besides a strengthening of the heart action, and help towards the removal of dry excreta. The almost total abandonment of aloes, coffee, and other medicaments for internal use is owing to the fear of pulmonary inflammation.

Of special importance for the course of the disease is a natural position

for the animal, and the cow must therefore be carefully watched. She must not lie on her side stretched out, as then tympanitis may supervene, nor with the neck held down, as then the stomach contents when thrown up and saliva may quite easily run down into the lungs. If the cervix of the uterus is not contracted, and if the uterus falls out between the labia, the position of the patient must be raised from behind, and, if necessary, a few stitches put in the labia.

Patients which have been treated in this way must not be milked until a good many hours have elapsed, for fear of a relapse, unless a repetition of the treatment should render this necessary. Even after recovery they should be milked very gently and not exhaustively.

It is of the utmost importance to apply this treatment as early in the course of the disease as possible, for although severely attacked patients may recover, they yet run great risk of complications with pneumonia, rupture of a muscle, &c., if they remain without attention. It is certainly very difficult in some cases to diagnose milk fever, but Mr. Schmidt has taught his clients a simple means of doing this in a rough and ready way. They can generally tell that the animal is affected if, after she shows vague symptoms of the disease during the first few days succeeding birth, they take her out of the byre and walk her up and down a little. If her gait is staggering or uncertain, the case is generally one of milk fever. By sending for the veterinary surgeon when these symptoms appear the farmer saves many a good cow.

The effect of the double treatment is so rapid that in a quarter of an hour a distinct improvement can be noticed, especially when the patients before and during the treatment have been very comatose. The treatment is very easy of application, easier than injection by means of a funnel and the following necessary massage The apparatus can be kept aseptic, and it is easy to avoid infecting the udder. Mr. Schmidt has treated by this method 51 patients, all of which recovered; 48 remained free from complications, and rose to their feet 1 to 16 hours (on an average 5 hours) after treatment; the remaining 3 recovered from the disease just as quickly, but lay longer on the ground, 2 of them on account of lameness in one of the hind legs, and the third because the placenta remained behind, and there was inflammation of the uterus. In no case was it necessary to repeat the treatment. The milk secretion went on all right in every case.

Mr. Schmidt thinks it of doubtful utility, for the purpose of averting this disease, to feed all or even the majority of the cows very sparingly for the time immediately preceding the birth of the calf; by doing so the amount of the milk is distinctly decreased, and the probability is that the loss thereby occasioned would be greater than that caused by the fever breaking out here and there. As things go, nearly a hundred per cent. of the cases are cured, and that generally in a few hours, whilst in the future the probability is that the loss caused by milk fever will be very small. For the same reason it would not be profitable as a general rule, to employ specially efficacious, not to say drastic measures, such as the injection and air pumping above described, merely for prophylactic purposes, as the loss of milk would be very serious.

(*Berliner Thierärzt. Wochenschrift.*)

CONTRIBUTION TO THE STUDY OF CHRONIC ABSCESSES IN THE BASE OF THE NECK IN HORSES.

In a horse of German breed, six years old, used for drawing heavy loads, M. Trinchera, of the Veterinary School of Milan, diagnosed at the base of the right side of the neck a swelling, the surface of which showed several points deprived of the epidermic layer. Towards the centre of this swelling there was a nodule the size of a hazel nut, of fibrous consistency, very sensible to pressure, attached by a large peduncle to the corresponding mastoido-humeralis muscle. Recognising by these symptoms the presence of an encysted abscess in its initial stage, M. Trinchera was of opinion that the best way to avoid extension and aggravation of the lesions was to remove the tumour at the earliest moment.

After having incised and cut away the skin to the requisite extent, he removed, in addition to the mass of the lobule, the infiltrated fibrous tissue surrounding it, as well as a small layer of the mastoido-humeralis. The division of the nodule allowed him to observe that it was formed of fibrous tissue, the density of which became more pronounced the nearer the centre was approached. The latter consisted of a little cavity filled with pus of a benign nature. The application of a tubular drain and a cutaneous suture completed the operation. The edges of the skin-wound soon united by first intention; in sixteen days the cure was complete.

Relying on his observation of the case M. Trinchera considers himself justified in drawing the following conclusions on the pathogeny, development, and treatment of chronic abscesses of the shoulder :—

(1.) The pus of chronic abscesses which form at the base of the neck in horses originates from the penetration of pyogenic microbes in the subcutaneous fibrous tissue, the penetration being effected when the skin, by the action of the harness, is deprived of its epidermic layer.

(2.) The seat of the suppuration having been formed, a strong capsule of fibrous tissue is formed, which serves to isolate this seat and to prevent the diffusion of the abscess.

(3.) The encapsuled pus conserves itself for a long time and the walls of the abscess undergo a progressive augmentation by the addition of new layers of fibrous tissue, the result of the irritation produced by exterior causes, notably by the rubbing of the harness and by irritating medicaments.

(4.) While the new layers which produce the thickening of the walls of the abscess are forming there develops an infiltration of the neighbouring fibrous tissue, which surrounds and confuses the neighbouring organs to an extent corresponding with the age and the development of the walls of the abscess as well as with the intensity and the duration of the irritation produced in the region.

From the clinical point of view M. Trinchera also draws the following corollaries :—

(*a*) The swellings at the base of the neck, which are often taken for contusions, are nothing else than chronic abscesses.

(*b*) Chronic abscesses at the base of the neck should be treated as soon as they are diagnosed, for if delayed one runs the risk of seeing

them enlarge considerably. For this reason it is very important to make the diagnosis during the first phase of their development.

(*c*) The best and surest treatment for these abscesses is a surgical operation.

(*d*) If at first massage, friction, blistering, &c. are employed, one is very often obliged to have recourse later on to an operation when conditions are not favourable.

(*La Clinica Veterinaria.*)

POSSIBLE DANGERS IN THE USE OF LYSOL.

LINCK (*Arbeiten aus dem pathol. anat. Inst. in Posen*, 1901) has made a series of experiments on rabbits with a view to determining more accurately the toxicity of lysol. He thinks the subject deserving of attention, because in spite of its supposed non-poisonous character a few cases occur every year where lysol has been found to produce symptoms of poisoning and even death, either when applied externally, used to irrigate the bowl or wash out the uterus, or taken inadvertently by the mouth. Details are given of a case occurring in Posen, in which 50 c.cm. of undiluted lysol were accidentally included in an enema. Unconsciousness followed, with stertorous breathing, feeble pulse, loss of reflexes, and rigidity of the extremities, and death occurred the same day. Introducing lysol into the large intestine of rabbits, Dr. Linck found that a dose of 0.224 c.cm. per kilo of body weight produced slight clonic convulsions, which were intensified by larger doses, 0.566 c.cm. produced unconsciousness, and 1 c.cm. death. The symptoms depended on the total dose, and did not vary with differences in its concentration. Erosions, more or less extensive, were found in the intestinal mucosa. When the lysol was introduced into the stomach the same effects were produced, but a larger dose was required; 1.16 c.cm. per kilo failed to produce any toxic symptoms, and 1.8 c.cm. was the minimum necessary for a fatal result. Comparing the post-mortem appearances found in the patient who died after administration of the enema with those produced in the rabbits experimented upon, it was found that there was a correspondence in the intestinal lesions.

NEUROMA SUPERVENING AFTER MEDIAN NEURECTOMY.

BY M. JEON DUPAS, VETERINARY SURGEON, 31ST REGT. FRENCH ARTILLERY.

THE patient, nine years old, lame on both fore feet from navicular disease that had previously been treated, was operated on by M. Dupas on February 28th, 1902, three centimetres of the nerve being removed. Trotted directly afterwards he was nearly sound.

On February 29th there was a great deal of swelling and œdema of the part, which increased, involving the whole of the limb inside the fore arm. It was hard and painful. On 7th March the enlargement extended to the fetlock, where it gradually decreased except at the upper part.

On March 6th the sutures were removed and the wound healed up, but on March 12th the horse was lamer than before the operation, and he was quite unable to extend the fore arm. On examination at the cicatrix a

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small elongated tumour was discovered that rolled under the fingers and caused most acute pain when pressed.

The tumour was removed on April 5th, the incision being made a little behind the former one. It lay under the antebrachial aponeurosis, was the size of a small nut, ovoid in shape, and of a fibro-cartilaginous consistency, seemingly developed from the external surface of the nerve stump, which appeared to be abnormally enlarged. After the operation the horse went sound.

On May 1st he was sound on the off limb, the one operated on, but lame on the near, which lameness is increasing and a neuroma developing, that M. Dupas intends to operate on also. He reports the case as he is unaware of a similar observation being made with regard to median neurectomy.

(*Recueil de Médicine Vétérinaire*, 14th Sept. 1902).

JOSHUA A. NUNN, F.R.C.V.S.

GLANDERS IN LONDON.

MR. A. SPENCER, crief officer of the Public Control Department of the London County Council, in his report for ths year ended March 31 last, just issued, says:—Of 1857 cases of glanders reported in London during the past year, 287, or nearly 15½ per cent. were disclosed solely by the aid of mallein injected on account of the animals having been in contact with diseased horses, and in these cases a higher rate of compensation has been awarded. Mallein has also been employed to aid diagnosis in upwards of 450 cases where the external evidence of disease was slight or not sufficiently characteristic to enable the veterinary inspectors to condemn the animals as diseased, but the *minimum* rate of compedsation only has been allowed in respect of the slaughter of these animals. There is again a marked increase in the number of cases of glanders reported during the year, the figures being upwards of 25 per cent. in excess of the figures for the preceding year, when 1486 cases were reported." Mr. Spencer owns that "it is not easy to assign the causes for this increase," but remarks that "mallein is useful to unscrupulous owners in enabling them quietly to weed out suspicious cases from their studs, and its use for this purpose may account for some increase of glanders in recent years. It therefore becomes more than ever important for owners to test new purchases by injecting them with mallein before permitting them to come into contact with existing studs. The neglect of this safeguard has been the cause of some of the most serious outbreaks of glanders in London—outbreaks which have involved heavy loss both to owners and to the Council. The insanitary and congested state of some London stables and the carelessness of some owners with regard to the indiscriminate admixture of in-contact horses with healthy stock are also undoubtedly factors in keeping the disease alive." Recognising the inadequacy of existing law, the County Council are seeking to induce the Board of Agriculture to promote legislation on the lines recommended by the Board's own departmental committee, and which would provide (1) compulsory notification of disease by veterinary surgeons; (2) the recognition of a reaction to mallein as diagnostic of glanders; (3) power to deal with in-contact horses as suspected animals.

ACTINOBACILLOSIS.

M. NOCARD read at a meeting of the Société Centrale a paper prepared by M. Lignières of Buenos Aires, having for its sub-title "A contribution to the study of affections known under the name of Actinomycosis." It shows that under this name diseases have been described that are produced by many parasites differing specifically to a very considerable extent. The oldest known is due to a streptothrix to which Harz and Bollinger gave the name of actinomyces. This streptothrix is characterised by caseous foci or by inflammatory neo-formations of the tissues, in the centre of which the parasite appears under the form of small masses of yellowish colour and mulberry appearance, which result from the agglomeration of the filaments of the streptothrix tangled together inextricably in the centre, radiating at the periphery, and swelled out in the form of a gun-stock. These veritable tufts take on intense yellow when treated with a preparation of picro-carmine; when taken separately and treated with Gram colouring they appear like a close web of branched filaments of a deep violet colour; the terminal swellings, butt-shaped, do not take colour by this method. The disease studied by M. Lignières resembles closely true actinomycosis; it shows itself in the same way by inflammatory neo-formations and foci of suppuration of the most diverse organs and tissues, in the centre of which we find little mulberry-form masses, whose periphery, so to speak, bristles with egg-shaped or pear-shaped swellings, taking bright yellow from picro-carmine; but when we separate the tufts and treat them by the Gram method we do not succeed in bringing out the branched filaments which characterise the Harz streptothrix. The investigations of M. Lignières show that these tufts are due to a particular microbe differing very considerably from the streptothrices; we have here to do with a delicate bacillus which does not take on Gram colouring and which seems to be a near relative of the Pasteurellæ. When isolated in pure cultures it reproduced the disease in animals inoculated with it, and we find in the lesions which it produces the radiated tufts which characterise the natural disease and which explain why we have so long confused it with true actinomycosis. M. Lignières proposes to designate it by the appropriate name of actinobacillosis. It rages in Argentina in epidemic form, striking 20, 30, 40, and even 60 per cent. of the infected herds and showing a power of expansion which actinomycosis has never shown. It is not, however, confined to South America, and certainly exists in France. M. Nocard has several times observed cases of "wooden tongue" in which it was impossible to colour by the Gram method the mycelium of the radiating tufts which picro-carminated glycerine impregnated with a vivid yellow tint. These were probably cases of the Lignières disease. Since hearing from M. Lignières M. Nocard had had an opportunity of studying a splendid "wooden tongue" sent him by a slaughterhouse inspector; in it he had found the actinobacillus with all the characteristics attributed to it by M. Lignières: morphology cultures, pathogenic effects, biological properties—everything was identical. When inoculated into two cows the Lignières microbe and that obtained by M. Nocard from the "wooden tongue" gave rise to indurated tumours, dimly fluctuating, the central caseous pus of which contained the same radiating tufts, colouring yellow with picro-carmine.

Although closely analogous to true actinomycosis, actinobacillosis may

yet be easily differentiated, even clinically. In actinomycosis the lymphatic ganglia which collect the lymph from the invaded organ rarely participate in the infection; in actinobacillosis, on the contrary, they are always affected, they are always hypertrophied and full of nodules, and largely resemble those affected by glanders. On the other hand the parasitary tufts of the pus of actinomycosis appear under the form of small masses of sulphur-yellow tint more or less vivid and often calcified; in actinobacillosis the calcareous infiltration of the tufts is a rare exception, and their tint is whitish or greyish.

(*Recueil de Méd. Vét.*, 30th August 1902.)

Reviews.

We have received for review the ANNUAL REPORT of the VETERINARY SURGEON to the CORPORATION of GLASGOW for 1901, and find some rather startling statements therein. Firstly, that out of 46,784 head of cattle slaughtered for human consumption 6332, or about 13½ per cent., were found to be tubercular. Secondly, that of 195,860 sheep slaughtered 6·003 per cent. were found to be tubercular. This latter statement would seem to indicate that the susceptibility of sheep to tuberculosis is somewhat greater than generally supposed. With reference to trichinosis Mr. Trotter, the veterinary inspector, found that home pigs were free, but that several cases of trichinosis were discerned in American pork.

It is to be hoped that all cities and towns will do as Glasgow does, and have a competent staff of experts to examine their food stuffs.

ANATOMICAL SKETCHES FOR TEACHERS (Anatomische Collegheft-skizzen). Berlin: RICHARD SCHOETZ. Price 4s.

Under this title we have received a brochure containing twenty-five anatomical drawings of the horse by Dr. R. Schmaltz of the Berlin Veterinary College, editor of the *Berliner Thierärztliche Wochenschrift*. In the preface to this, the second, extended and improved edition, of his little work, Dr. Schmaltz says that, as many of the sketches have to serve for the depiction of a great many objects, confusion might arise if it were attempted to portray them all on one sheet, and therefore he has given these in duplicate, and sometimes in triplicate. For the proper use of these sketches he recommends that they be unstitched, and each pasted separately into the lecturer's book. As the colouring must be performed during the lecture, the lecturer has to depend upon black and coloured pencils, and if he be skilful he can accomplish much with the black pencil alone; in some cases, however, coloured pencils are indispensable, as, for instance, when one organ or object overlies another. He advises the lecturer to do as much as he can with the black pencil alone, but when he adopts colours to choose dark ones. The important point is the drawing of muscles, and in so doing their position and limits, and the course of the tendons, must be clearly brought out. Therefore, the mass of the muscle will not be indicated in colour, but its outlines must be given by lines which do not lie too close together. If one muscle overlies another, the

upper must be indicated by comparatively few lines, so that the lower may not be hidden. It will generally be found sufficient to connect the origins and insertions by a few bold strokes, or, in the case of large muscles which cover a lot of others, merely to indicate the outlines of the mass. Dr. Schmaltz adds wisely that drawings are a great help in teaching: if the professor himself can draw he makes his teaching much more vivid. We intend to utilise these sketches in our own teaching, and cordially recommend them to other teachers. Students preparing for examinations might do worse than test their anatomical knowledge by this means; the completed drawings would always be useful, as each man would have prepared them to suit his own ideas. The wording, it is true, is German, but that need not deter the English teacher or student; even the beginner would be able to spell out the meaning with the help of a dictionary, and besides, the Latin names are generally added.

THE BREEDING OF HORSES AND CATTLE IN NORMANDY (L'élevage du cheval et du gros bétail en Normandie). Paris: J. B. BAILLIERE ET FILS.

This little book has been compiled with great care by the author, M. Georges Guénaux. He is a thorough Norman, and unstinting in his praise of his province. He tells us that so far back as the twelfth century Normandy was famous for its horses. The old Dukes of Normandy were great horse-breeders, and Norman horses were preferred to all others for the army and for jousting. At the time of the Crusades the great Lords brought back with them the best types of Arab horses, and later, Spanish horses were imported to give distinction and energy to the breed. But the present breed of horses is quite different from that of the twelfth century, and the improvement, for such it is, has been brought about by the admixture of English blood. Nowadays horses bred in Normandy have all, more or less, English blood in their veins, and are therefore entitled to the name Anglo-Norman, by which they are known. Sometimes they are called half-bred (demi-sang), which indicates in a general way that they come of a sire of English race (pure blood) and a dam of common breed, or of more or less "advanced" blood. Production of these half-breeds is a complicated and delicate matter, and demands great skill on the part of the breeder as well as great experience. Sometimes crossing with the English breed produces at the beginning a great many "lop-sided" (décousus) animals, presenting the characteristics of both types; the two parts often appear badly welded together, so to speak. There may be a fine strong body and long thin legs, or perhaps the fore-part of the old Norman horse with the hind-part of the English. The book goes on to describe the efforts made by breeders to get rid of these anomalies, and states that the prevalent strain is English, with the result that buyers from all parts of Europe and even from America are attracted to Normandy for stallions. To this province also the agents of the French War-Office come for their remounts. The second part of the book deals in the same exhaustive way with cattle-breeding, and we commend the details to those of our readers who come much in contact with farmers, especially in the south of England. We all know what enormous quantities of dairy produce come to the London market from Normandy, and what opportunities the English farmer throws away, either

from sheer indolence or from a disdainful unwillingness to take a lesson from his neighbours across the channel. Quite an interesting chapter deals with the manufacture of cheese in Normandy, and if any one doubts the industry and enterprise of the French dairy farmer, we advise him to read that portion which describes the making of Camembert cheese. We have all tasted that delicious product of the Norman farms, but perhaps not one in a hundred knows what infinite care is required in its manufacture.

The book is well illustrated with drawings and photogravures, of which there are no less than seventy intercalated in the text.

Correspondence.

1st Cavalry,
Batangas, Prov. of Batangas, P.I.,
July 31st, 1902.

To the Editor of
The Veterinary Journal.

Dear Sir—In the May 1902 number of your valuable Journal, page 292, I notice "a report on the parasitic disease of horses, mules, and caribao in the Philippine Islands," by Captain J. J. Curry, M.D., Assistant-Surgeon U.S. Volunteers, Member of the Board to investigate diseases in the Philippine Islands.

Captain J. J. Curry says he arrived in Manilla October 26th, 1901, and found that Assistant-Surgeon Allen Smith, U.S. Army, with Surgeon J. J. Kinyoun, of the Marine Hospital Service, had discovered a parasite in the blood of horses and mules affected with a fatal epidemic disease. Whilst I have no doubt the veterinary profession appreciates the assistance and discoveries of our medical brethren, it seems to me that it would be just as well for them if they were aware that there are such things as veterinary surgeons and veterinary literature. The report of the discovery of a new parasitic disease of animals, as it appeared in a pamphlet signed by Captain Allen Smith and issued from Department Headquarters during the autumn of 1901, showed an utter absence of knowledge of the existence of either veterinary surgeons or literature, either of which could have enlightened our medical friends and prevented them making such ridiculous claims as regards their discoveries. The following speaks for itself. On October 25th, 1901, in an official communication to Headquarters Department of Southern Luzon, P.I., I called attention to a disease called "Surra," and asked that the feeding of native grasses to American troop horses be stopped with a view to preventing to some extent said disease. After the communication had travelled through the ordinary military channels it was referred to Chief-Surgeon of Department, who referred it to Captain Allen Smith, the officer in charge of the Army Bacteriological Laboratory, and it was returned to me with the following endorsement:—

[*Extract.*]

. . . . . .

Captain Allen Smith does not believe that native grasses have anything to do with causing the disease. . . . Hypodermic doses of quinine will cure it. . . . Has been studying this disease, &c. &c.

I also received a pamphlet upon a new parasitic disease of animals by Captain Allen Smith, which stated the disease might be due to slugs or flukes which attack the liver of horses, &c. General Sumner, who was in command of this brigade at the time, ordered me to put in a full report of the disease, which I did, and eventually received it back again with full endorsements from various authorities, and also noticed that there was another report out by Captain Smith, this time calling it "Surra." My endorsement on the third communication was briefly as follows :—

[*Extract.*]

BATANGAS, PROV. OF BATANGAS, P.I.
(*Through military channels.*)

Adjutant-General, Department S. Luzon,
Manilla, P.I.

I have the honour to submit the following hereto attached and marked "A." . . . . . .

Surra is not a new disease ; no doubt it has always existed in countries and climates suitable for the development of the parasite that causes it. More than twenty years ago the actual cause was located and recognised by different medical men and veterinarians ; perhaps G. Evans, M.D., an Inspecting Veterinary Surgeon in India was the first to thoroughly describe the parasite in his report on "Surra Disease" in the Dera Ismail Khan District, November 13th, 1880. Many others at different times have observed, described, and experimented with surra since that time. It is a very important disease from a military and monetary standpoint, as the English have found out to their cost ; in one regiment, the 3rd Puujab Cavalry, they lost 300 horses during one outbreak. My attention was first called to "Surra" in the library of the Royal Veterinary College, London, England, during 1887, at which time I was a student there. The first cases treated by me were two horses belonging to troop "L" of my regiment during December 1900 ; since that time many of our troop and transport animals have suffered from "surra," and my official certificates give the disease as "surra." My attention was attracted by a circumstance that occurred some time ago at Calumbo, Laguna, P.I., when a large number of mules were destroyed because of a supposed outbreak of glanders, at least that is what the gentleman sent down from Manilla, P.I., diagnosed it. This appeared strange to me, as glanders in this section is very rare and "surra" very common, and many other animals have surra at Calumbo. As regards Captain Allen Smith's reported cure for surra, viz., hypodermic injections of sol. of quinine,—it has been tried in many cases for a period extending over twelve months, but without one recovery. I may state that at the time the cure was reported Captain Smith had not had sufficient time to test the efficiency of his remedy from the date of the time his attention had been called to the disease. In his later preliminary note on a parasite disease of horses he advises quinine, arsenic, and iron. Iron is one of the main standbys and the best hæmatinic in anæmia, and as anæmia is one of the results of the attack of the parasite iron does benefit the animal, but without removing or doing away with the cause, thus prolonging life to some extent. Arsenic administered in certain forms and with due care, and in carefully regulated doses and stated times, will lower the percentage of deaths to some extent presumably by getting rid of the parasite. I have taken the liberty of using the directions of Dr.

Lingard, who is in charge of the Imperial Bacteriological Laboratory, India, which I enclose. Dr. Lingard is the veterinary officer who was detailed by the British Government to investigate "surra" in India.

The surra parasite, Trichomas Evansi, is a flagellum, not a spirulum (Crookshank, pp. 596-480), measuring 1 to 2 micrometres wide and 20 to 30 long, with an oval central portion; continuous whip-like lash at one end, which is about the same length as the main portion; the other terminates bluntly, from which projects a spike-like process near which is a clear-like spot. Often two are apparently joined together, most probably during copulation; sometimes several united, forming a stellate group. They are very motile, as seen in freshly drawn blood, and these movements give one the idea that they are many-shaped. They resemble the families Cercomonadide and Trichomas of the order Euflagellates in having a number of anterior flagella directed forward, with the exception of a longer one than the body, and extending backwards, to which it is fixed for the greater part of its length by a thin membrane, but with no posterior flagellum.

The Trichoma Evansi progresses both ways; their long thin neck terminates in a blunt head; they attack and destroy red blood cells. The Tricocephalus Dispar (Rud.) of man, which Dr. Smith mentions as resembling the surra parasite, is represented in the lower animals by the Trichocephalus Affinis (Rud.), has a head furnished with two transparent vesicular enlargements in the form of wings. The marginal papillæ of the longitudinal bands are longer than the others. The male measures 6 c.m. to 8 c.m. long. The spccula of the male is very long, is studded with triangular spines, the points of which are posterior. They belong to the nematodes, the family Strongylides, and genera Sclerostomines; they inhabit the large intestines of the ox, goat, and sheep (Neuman), and are in no way related to the trichomas.

Crookshank, 4th edition—*Bacteriology and Infectious Diseases.*—The Trichoma Evansi is identical with the Trichomas Carassi found by Mitrophanow in the carp and others, as follows:—

Genus—TRICHOMAS.

Sub-genus—***Trichomas Sanguinis.***

Elongated tapering bodies provided with a spiral (T. Corbitis) or longitudinal (T. Carassi, Lewisi, Evansi) membrane terminating in a rigid filament and an anterior flagellum. Highly polymorphic. Habitat blood.

Species Trichomas Corbitis—Mud Fish.
" " Carassi—Carp.
" " Lewisi—Rot. Hamster.
" " Evansi—Horse, Mule, Camel.

From personal observations of surra among mules, horses, and ponies during a period of over twelve months, I find the following to be the facts:—Surra is invariably fatal to mules; fatality in the case of American horses, 30 per cent.; native ponies, 40 per cent. It does not exist to any great extent during the dry season, but commences in violence about one month after the rainy season has commenced, especially in those animals that are fed on grass. In those animals that are fed on grass I have seen only two cases—one a mule with a large pack sore; one a horse suffering from a wound (infected no doubt by flies carrying virus from diseased animals).

There is no doubt but what the moisture on the grass contains the ovum of the parasite. Crookshank, 4th edition, p. 593, says that the disease only exists where there is impure water, and Rankin ("Surra in Horses," *Veterinary Journal*, English, page 402, December 1891) has repeatedly found the spores in water and on wet grass. J. H. Steel, a veterinary surgeon (Army Veterinary Department), reported an obscure and fatal disease amongst transport animals in British Burmah, 1885, and regards it as due to bad water and swamp grass, in and on which the organisms were found. The native grass-cutters here always wash the grass in pools of water before delivering it, sometimes allowing it to lie in water all night. It weighs heavier and looks fresher.

These parasites do not seem to injure the health of cattle and rats although their blood may swarm with them (Lingard's report).

I have caused surra in the dog by inoculation of fresh blood with fatal results.

Symptoms.—Extreme languor; paleness of mucous membranes, and the appearance of petechiæ on the membrana nictitans are characteristic even in the early stages; as the weakness increases the animal loses flesh rapidly (sometimes an animal in good condition dies). One of the diagnostic manifestations are the paroxysms during which the fever rises as high as 41° C., with intermissions during which the temperature may be below normal. The average temperature during the course of surra according to several charts that I have kept is 39·5° C. Pulse small and fast—it is often of the variety "pulsus alternas." Respirations are peculiar—more rapid, twenty or more to the minute; and there is apparent a double movement of the abdominal muscles upon expiration upon auscultation; dull areas are apparent from which the vesicular murmur is absent, and in other places bubbling râles.

The gait, especially of the hind limbs, is staggering in the extreme—the animal often falling and unable to rise except after repeated efforts. There is no discharge from the nose except occasionally a few minutes before death a material of a frothy nature. Sometimes the Schneiderian membrane is covered with petechiæ or even bullæ; bleeding from the nose is rare. The urine is highly albuminous in all cases. Sometimes there is no apparent œdema, but that is the exception, as the swelling due to the transudation of fluid from the blood to the lymph spaces and increasing heart weakness is progressive, the under portion of the abdomen, legs, and sheath are often enormously swollen. I have seen an animal almost square from the accumulation of fluids into the subcutaneous tissues. Occasionally the submaxillary glands swell up but do not burst as in strangles in glanders. There is an extremely haggard expression to the face and eyes and the hair is dull. Sometimes nervous symptoms are apparent, due to œdema and anæmia of the brain; the animal then runs round in a circle for days, becoming almost frenzied, again signs of colic may present themselves; loss of power of one or more limbs, especially the hind, is a frequent symptom. All through the course of this disease the animal has a good appetite; if anything, it is increased above the normal. The poor beast acts as if, and is really, slowly starving to death. Sometimes the cornea bulges and in rare instances the eye humors escape.

Diagnostic signs.—Progressive anæmia, paroxysms, extreme pallor, or yellowish mucous membrane; petechiæ on conjunctiva, staggering gait, œdema, good appetite, and, most important, the presence of the hæmotozoa in the blood.

There are three diseases which are often mistaken for surra—simple anæmia, glanders, and a very common trouble which the English veterinarians call "epizootic lymphangitis," or African farcy, a disease in which the lymphatics are involved, and ulcerate generally upon one of the hind limbs which is often enormously swollen; it is very contagious and quite a number of horses die from it, but it is in no way related to "surra" and is amenable to treatment.

Autopsy—Macroscopical appearance.—Body generally reduced to a skeleton (not necessarily), does not swell up within a few hours of death. *Rigor mortis* prompt. By dividing the skin behind the fore limb and turning limb over forwards, then incising from sternum to dorsal; along spine about four inches towards the abdomen, sawing through the ribs and down the flank, the side of the animal can be turned over so as to expose the internal organs. There is apparently no change in the intestines or peritoneum except a paleness, and there are invariably present some few of the following species of entozoa in the peritoneum, the Filaria papillosa in the cæcum and large colon, Oxyuris curvula in the stomach, one or more Lavæ of the œstrus, and, if the stomach is full of masticated food, upon close examination there will be noticed an undulating movement in many places, this is due to myriads of the Spiroptera microstoma which are invariably present, and which cause many small abrasions upon the internal coat of the stomach. Spleen usually slightly enlarged but of firm consistency, pancreas unaltered. Liver enlarged, brick-red, and friable, but not containing any parasites. It was remarked in a note on a new parasite disease of the horse that distomas might cause "surra." Desquamative nephritis is often noticed, the kidney capsule is non-adherent and contains pus. The heart is streaked and very fatty and contains clots of palish yellow. The lungs show signs of catarrhal pneumonia, they are mottled and many little abscesses containing pus are seen; lymphatics swollen. The peritoneum may contain a small quantity above the normal of serum, pericardium a large quantity, and the pleural sac has sometimes an exudate of a serous, sero-fibrinous, or even purulent character. Large veins contain clots.

The muscles are pale and bathed in lymph, which fill the intercellary network. The brain is often œdematous and fluids are in excess in the sheaths of the spinal cord.

Taken as a whole, all the organs and tissues show marked signs of parenchymatous and fatty degeneration, some being swollen, translucent, and having a dull greyish look, others are large and soft and greyish yellow in colour or mottled with yellowish streaks. Often an aneurism of the great mesenteric or cœliac artery will be found, which contains numbers of the Sclerostoma armatus.

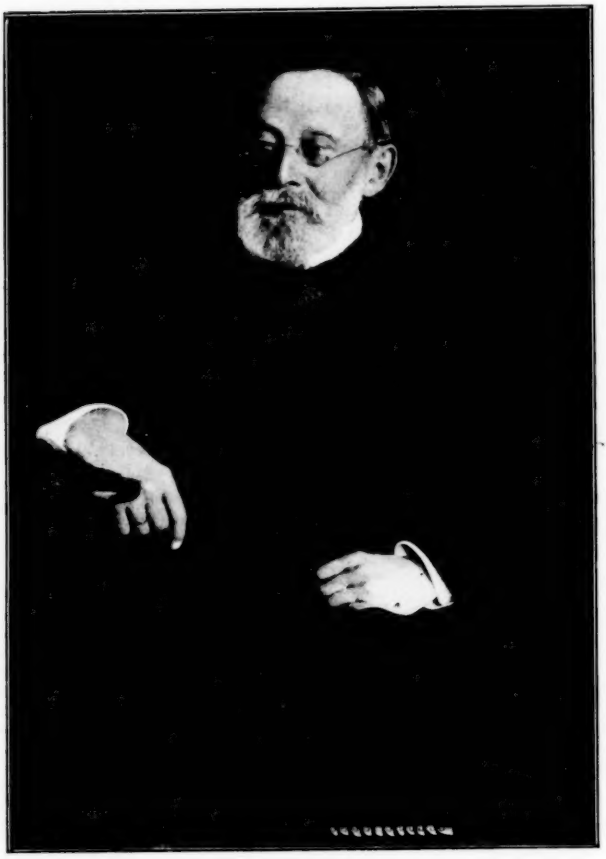
. . . . . .

*Treatment.**—As advised by Lingard.

COLEMAN NOCKOLDS, M.D., V.S.
Senior Veterinarian, 1st Cavalry, U.S.A.

BATANGAS, P.I., *Nov.* 1901.

(* Which was officially adopted with excellent results.)



RUDOLF VIRCHOW, M.D.,
PROFESSOR OF PATHOLOGICAL ANATOMY, BERLIN.

[*By permission of Elliott & Fry.*]

Obituary.

RUDOLF VIRCHOW, M.D.

Professor of Pathological Anatomy, University of Berlin.

IT is with the deepest regret that we announce that Professor Rudolf Virchow died at his house in Berlin on September 5th. On January 3rd of the present year he fell while alighting from an electric tramcar in the Leipziger Strasse, Berlin, and suffered a fracture of the neck of the femur. He recovered to a considerable extent from the effects of the accident, and there seemed for a time to be a prospect of his restoration to active life; two or three weeks ago, however, he began to lose ground, and his condition gave rise to such anxiety that a few days ago he was brought back from Harzburg to Berlin. He died peacefully in the arms of his wife—an unmarried daughter who lived with him and his daughter-in-law being also present. Though it was clear that he was sinking, it was not known that the end was so near. His son, Professor Hans Virchow, who had called in the morning and gone away, was hastily summoned in the afternoon, arriving just before his illustrious father passed away.

Grievous though the loss of such a man must be, we have not to mourn in him a life cut short before the fulfilment of all that it held in it of promise for the advancement of knowledge and the good of mankind. Virchow had done his work, and he has left us heirs of all the produce of his teeming brain which wrought in fruitful activity, "without haste but without rest," throughout his long life.

BIOGRAPHICAL SKETCH.

Rudolf Ludwig Karl Virchow was born on October 13th, 1821, at Schivelbein, a small town in Pomerania. He was the son of a shopkeeper, but beyond the names of his father and mother, Karl Virchow and Johanna Hesse, nothing is known of his family. Till his thirteenth year he lived at home, attending the public school of his native town, and later being prepared for the gymnasium by private tuition. In 1835 he entered the gymnasium of Cöslin, the chief town of the district. There he came under the influence of the Director, Otto Moritz Müller, whose attention was drawn to him by his knowledge of Latin, which was remarkable in a boy of thirteen. He passed out of the gymnasium first on the list of the *Abiturienten* in 1839. Among the subjects in which he presented himself for examination was Hebrew, which he had taken up merely from a love for the study of languages. He gave a further proof of his taste for philology by learning Italian without a teacher between the time of his leaving the gymnasium at Easter and beginning the study of medicine in the following autumn.

Virchow entered the Friedrich Wilhelm Institute, founded for the education of medical officers for the Prussian Army. From that famous "Pepinière" have come at different times such men as Nothnagel, Fraentzel, Loeffler, Gaffky, Gaertner, and others who have writ their names large in the history of the development of medical science. Among Virchow's fellow-students was Helmholtz. Among his teachers were Johannes Müller, Dieffenbach, Schoenlein, Froriep, and Casper. In addition to the ordinary subjects of the medical curriculum, Virchow, with characteristic catholicity of intellectual interests, attended lectures on logic and psychology, on history, and on Arabic poetry. On October 21st,

1843, he took his doctor's degree at the University of Berlin, the subject of his inaugural dissertation being *De rheumate praesertim corneae.*

Almost immediately after graduation Virchow was appointed Assistant to the Prosector of the Charité Hospital. That post was then held by Robert Froriep, and on his resignation in 1846 Virchow was chosen as his successor. In the following year Virchow qualified as *Privat-docent.* About the same time, in conjunction with his friend Benno Reinhardt, he founded the famous *Archiv* which bears his name, and which he continued to edit till his death. In 1848 he was sent by the Prussian Government to investigate an epidemic of typhus fever which was raging in Upper Silesia. In his report he did not confine himself to the strictly medical aspects of the question, but discussed fully and freely the historical, economic, and hygienic factors concerned in the outbreak. He indicated a number of social reforms as necessary adjuncts of sanitary measures for the prevention of such epidemics. The report, in which Virchow expressed democratic opinions in the most outspoken manner, caused much fluttering of official dovecots, and brought the author's name prominently before his countrymen not only as a scientific investigator but as a social reformer.

Virchow's political activity brought him into conflict with the authorities. He was compelled to resign his appointment as Prosector to the Charité. But his politics had not made him neglect pathology. He had published his epoch-making researches on phlebitis, thrombosis, and embolism, and on leukaemia, besides numerous contributions to morbid anatomy. He had also made his mark as a teacher.

INSTALLED AT WÜRZBURG.

His reputation had already become so considerable that he was offered a Chair by the University of Würzburg. He took possession of the Chair in May 1849, and it is probably more than an accidental sequence of events that *Die medicinische Reform* ended its brief but stormy career in the following June.

At Würzburg Virchow remained till 1856. To that period belong a number of researches on phthisis and tuberculosis, cretinism, typhoid fever, and cholera typhoid, adipocere, the anatomy of the nails and epidermis, congenital hydronephrosis, echinococcus of the liver, amyloid degeneration of lymphatic glands, the corpuscles of bone, cartilage, and connective tissue, &c. He edited a *Handbuch der speziellen Pathologie,* and collaborated with J. Vogel in the production of a manual of general pathology. In that book are found the elements out of which a few years later he built the stately edifice of the *Cellularpathologie.*

RECALLED TO BERLIN.

In 1856 Virchow received an invitation to become Professor of Pathology at Berlin. He accepted it on the condition that an institute for practical work was founded. The readiness with which the authorities met his views showed the importance they attached to securing his services. When he entered on his career as professor at Berlin the museum of Morbid Anatomy contained only some 1500 preparations. When, on his eightieth birthday, he received the congratulations of the scientific world in the new Pathological Musuem, which is the outcome of his own indefatigable exertions, the number of preparations was stated to be nearly 23,000.

XUM

THE "CELLULARPATHOLOGIE."

In 1858 appeared the *Cellularpathologie*, in which he laid the foundations of scientific pathology. The conception on which the whole structure rests is formulated by the author in the famous proposition, *Omnis cellula a cellula*. The work is one of the classics of medical literature, one of the great landmarks in the road leading from the darkness of ignorance to the light of knowledge. Of this monument of patient research and brilliant generalisation, Lord Lister said that it "had swept away the false and barren theory of a structureless blastema, and established the true and fertile doctrine that every morbid structure consists of cells which have been derived from pre-existing cells as a progeny . . . Even those morbid structures which deviate most from the normal structure are known to be derived as a progeny from normal tissue—from normal cells, driven to abnormal development by injurious agencies." The principles set forth in the *Cellularpathologie* were applied by Virchow to the elucidation of the genesis and development of tumours in his other great work, *Die krankhaften Geschwülste*, which was published between 1863 and 1867. Among other monographs may be mentioned one on chlorosis, one on syphilis, one on trichinosis, and one on the Siamese Twins.

HIS LITERARY PRODUCTIVENESS.

His addresses, lectures, and miscellaneous papers are almost innumerable. In 1893 he delivered the Croonian Lecture of the Royal Society, taking as his subject the Place of Pathology in Biological Study. He also delivered addresses, each in its way memorable, at the International Medical Congresses of London, Berlin, Rome, and Moscow. In 1898 he delivered the Huxley Lecture at the opening of the winter session of the Charing Cross Hospital Medical School; in this he summed up in a masterly manner "recent advances in science and their bearing on medicine and surgery." The astonishing range of his work is shown by the almost encyclopædic variety of the subjects with which he dealt. He was an acknowledged leader in anthropological, ethnological, and archæological research, and was equally at home in studying the racial characteristics of skulls ancient and modern, the colour of the eyes and hair of school children in different countries, and in the exploration of old Trojan graves. He was the guiding spirit in Schliemann's excavations on the sites of Troy and Mycenæ, and recorded the results of his researches in two books, "Contributions to the Topography of Troy" (1879), and "Old Trojan Graves and Skulls" (1882). He was for some time President of the German Geographical Society, and took an active part in its proceedings.

His work as a hygienist alone would entitle him to the everlasting gratitude of his fellow-citizens, for it is mainly owing to his persistence in urging administrative and sanitary reforms that Berlin is now one of the healthiest cities in the world. He was for many years one of the most active members of the Berlin Town Council, and he used the influence which that position gave him to bring about the reform of many police abuses and to promote the comfort and well-being of the people.

HIS EIGHTIETH BIRTHDAY.

Less than a year ago, when Virchow celebrated his eightieth birthday, he received from all parts of the world enthusiastic testimonies of admiration

and affection. On October 13th, 1901, representatives of medical science from every civilised country, of the German Imperial and Prussian Governments, and of the Berlin Municipal Council, assembled in the Pathological Museum—which may almost be called the concrete embodiment of his life-work—to do him honour. On that occasion Lord Lister, speaking on behalf of the Royal Society and other learned bodies of Great Britain and Ireland, said: "All these bodies join in the recognition of your gigantic intellectual powers, in gratitude for the great benefits which you have conferred on humanity, and in admiration of your personal character, your absolute uprightness, the courage which has enabled you always to advocate what you believed to be the cause of truth, liberty, and justice, and the genial nature which has won for you the love of all who know you."

THE MAN.

Professor Virchow retained his marvellous vitality of mind unimpaired till the end. He lectured as usual up to the time of his accident, and foreign visitors were deeply impressed by his grasp of the most recent developments of pathology. Always simple and modest, he never showed any desire for the honours and distinctions which are so greatly valued by the bulk of men. As a writer in the *Times* well says: "He was always the same, whether shaking hands with Royalty, accepting the respectful homage of an important deputation, packing up in his own house, or lecturing to the most scientific gathering in the world—always the simple little grey man, sincere, kindly, unassuming, absorbed in his subject, not in himself, crammed with information, profound and penetrating in thought, plain in utterance, the embodiment of accurate knowledge and sound judgment, the true servant of truth."

His political opinions kept him out of the sunshine of Court favour, but even in a country in which sovereigns and bureaucrats claim rule by Divine right, such a man could not altogether escape official recognition. He was a Medical Privy Councillor, and a member of the Medical Department of the Cultus Ministerium. France gave him the Cross of a Commander of the Legion of Honour; and from Oxford, Cambridge, and Edinburgh he received honorary degrees. Among all the honours conferred on him he most valued the Copley Medal, which was awarded to him by the Royal Society in 1893.

THE TEACHER.

In an interesting sketch of Virchow as a teacher given by Dr. Andrew H. Smith at the Virchow Dinner in New York on October 12th, 1901, the Doctor said: "The first time I saw Virchow was in the morgue at the Charité where the necropsies were held. While a student in New York I had seen a few necropsies, always made with the sole object of finding out what had been the immediate cause of death in the case in question, and always brought to an end the moment this was ascertained. Now for the first time I witnessed a necropsy made for the purpose of learning all of pathology which that particular cadaver could be made instrumental in teaching. Heretofore I had seen a body opened with an ordinary scalpel, most likely borrowed for the occasion from an operating case. The abdominal incision had been effected by a succession of timid hesitating cuts, beginning at the ensiform cartilage, and invariably helped out by a cross section through

the umbilicus. Now, with surprise and admiration, I saw Virchow take up a strong, heavy knife, with a stout handle, which he grasped with the whole hand, and by a single sweep of the arm he divided integument and muscle from the sternal notch to the pubes. Two strokes more on either side uncovered the costal cartilages, two fingers of the left hand were passed into the abdomen, and, with the knife between them, the remaining layers of the abdominal wall were divided by a single rapid movement. The same knife cut through the costal cartilages at the juncture with the ribs, the strength of both hands being sometimes required. Another knife with a strong narrow blade was then substituted, and with two dexterous crescentic motions the clavicles were disarticulated from the sternum. This was the pons asinorum of the students, and woe to the unlucky wight who, in attempting to imitate this apparently easy manœuvre, should chance to open the great veins at the base of the throat. He would be sorry for it but once, and that would be for the rest of his life. The sternum was then raised, a few strokes dividing the loose tissue beneath it, and turned up out of the way. Scarcely five minutes was required for the work up to this point. The heart was always opened *in situ* in such a manner as not to injure any of the valves or to disturb any thrombi or vegetations in the cavities. The lungs and the abdominal viscera were then examined in turn, the alimentary canal being opened throughout its whole extent. Not a single organ, no matter how healthy in appearance, escaped careful scrutiny, both of the surface and of the interior. This was the initiation of the method which very soon became universal. The room in which Virchow held his lectures was fitted up in a very peculiar manner. It was not a very large room, and nearly the whole of it was occupied by a table which was like the old Indian's farm, all long and no wide. It was probably 150 feet long and about 20 inches in width. After going around the four sides of the room it formed a second square inside of the first and a third inside of the second. It thus began in one corner of the room and ended in the middle, forming a sort of arabesque pattern. In the surface of this table was embedded a little tramway with two rails, and provided with a turn-table at each corner. On this tramway ran a number of little trucks, each on four wheels, and to these trucks were clamped the microscopes. These were of the simplest construction, mostly of Oberhauser's make, and having a magnifying power scarcely exceeding 350 diameters. Very few of them had any arrangement for inclining the tube. With such simple instruments Virchow had made the researches which had excited the admiration of the world. At the corner of the room where the table began was a blackboard on which there was a circle that represented the field of a microscope. Within this circle the professor, who possessed great dexterity with the crayon, reproduced the special features in the microscopic specimen which he was about to start on its journey along the table. Each student, as he looked into the microscope, compared what he saw there with what was represented on the blackboard. Meantime Virchow kept up a running fire of commentary on the specimen in question. By the time one microscope had gotten well on its way another was ready to begin its journey, and before the lecture was over some six or eight would have passed from student to student along the whole length of the table. The reagents employed in microscopic work were very few and simple. So far as I can remember, they consisted of sulphuric acid and tincture of iodine for demonstrating amyloid degeneration, silver nitrate for

bringing out the outlines of the cells, and acetic acid to render the nuclei more distinct. Carmine was used to a very slight extent, how little may be inferred from the fact that it was supplied to us in the form of the carmine saucers employed by the ladies for cosmetic purposes. Of bacteria, as we now understand the term, nothing was known, and the elaborate stains now in use had not even been discovered. Just as organic chemistry had to wait for the gaslight connections afforded by india-rubber tubing, so bacteriology had to wait for high objectives and oil immersion, aided by the differentiation effected by modern staining processes. The microscopic sections were made with a razor. Although there was a microtome in existence somewhere about the laboratory, it was seldom or never used, and was regarded more as a mechanical curiosity than as a necessary implement."

Dr. Smith proceeds: "As a lecturer Virchow showed a ready command of language. His style was exceedingly simple and clear, being free from those involved sentences so common among early speakers and writers, and which at once suggested a nest of pill boxes. Speaking about these sentences, he once said to me that, German as he was, in reading some of the older German works, he was sometimes obliged to analyse a sentence, and to say to himself, 'This subject goes with that predicate, and this relative with that antecedent, and this auxiliary with that verb,' just as if he were constructing a difficult sentence in Latin. He was convinced that this involved style had in the past been a serious hindrance to the progress of German science, and he early determined to form a simpler style for himself.

"Personally, his manner was affable and democratic; he encouraged students to gather round him after the lecture and to ask explanations of anything that they did not fully understand. He was a great snufftaker, and would pause a number of times in each lecture to enjoy his favourite luxury. I can hear now the preliminary tapping of this finger on the lid of his snuff-box and the half dozen strong nasal inspirations that followed. The impression that he left upon one was that of a genial, kindly man, as well as of a great scientist."

THE LAST RITES.

It was fitting that the man who had done so much for Berlin should have a public funeral. On Tuesday morning, 9th September, the procession started from the Rathhaus. Deputations from numerous scientific societies joined it as it wended its way through the streets. After the funeral, orations were delivered by Herr Kirschner, the Burgomaster of Berlin, who spoke in the name of the City of Berlin, Professor Waldeyer, who represented the University, and Dr. A. Träger on behalf of political friends.

It ought here to be stated that on the receipt of the sad news of Professor Virchow's death, the President of the Royal College of Veterinary Surgeons telegraphed to Madame Virchow in German as follows (in translation):—"In the name of the Veterinary Profession of Great Britain and Ireland and of the British Colonies, I ask you to accept our profound sympathy with you in your sorrow at the loss of the greatest pathologist in the world." The family of the late Professor suitably acknowledged the receipt of this telegram of sympathy.

VIRCHOW'S PATHOLOGICAL WORK.

In 1843 Rudolf Virchow, the pupil of Johannes Müller, graduated in medicine at the University of Berlin, and produced his inaugural dissertation entitled *De rheumate praesertim corneae.* The enormous number and extensive range of his subsequent researches may best be realised by a perusal of the Virchow bibliography issued by Schwalbe in 1901 to commemorate the pathologist's eightieth birthday. The mere enumeration of the titles of Virchow's contributions to pathology, medicine, and allied subjects occupies forty-six pages, and sixty-five additional pages are required for a similar list of his researches on anthropology and ethnology. The present article can do no more than take into account some of the salient features of his pathological work.

Virchow's great task was to free medical knowledge from the conflicting dogmatism and arbitrary hypotheses which encumbered it, and to establish its leading principles irrefutably by a process of sound induction from actual observations and experiments. At the commencement of his career the humoral theory was dominant, and the explanation of morbid processes was sought either in the nerves, the blood, or the exudations of the body. So long as these views prevailed, it was impossible to form a true appreciation of the brilliant discoveries of pathological anatomy which had been made in the Vienna school, and hence Rokitansky, their leading exponent, whose theory of crases and dyscrasies of the blood was supposed to explain anatomical lesions, was one of the first objects of Virchow's attack. Virchow's position was well defined in his introduction to the first volume of his *Archiv* published in 1847, and written at a time when his own labours had already accomplished enough to give him a grasp of the problem before him. "The rôle of pathological anatomy as a dogmatic science is at an end; for each individual law we must have the proof, clearly recognised, and carrying personal conviction. But where are the proofs to come from when the entire argument begins with a hypothesis?" The whole system, he goes on to say, must be changed, and the work of observation and experiment must take its place. "Pathological physiology will then gradually develop itself, not as the mental product of individual enthusiasm but as the result attained by many investigators from the outcome of laborious research. Pathological physiology will then be recognised as the stronghold of scientific medicine to which pathological anatomy and clinical observation form but the outworks." In these sentences is to be found the dominant idea which inspired Virchow's work and led to the results which we must now consider.

Virchow's first important labours were upon the nature of blood diseases. Commencing immediately after he took his degree with an investigation into the nature of phlebitis, he followed up these researches with a series of brilliant discoveries which alone would entitle him to a position in the front rank amongst the pathologists of last century. The conditions of vascular inflammation, the causes of thrombosis and embolism, and their relation to infection, were investigated; pyæmia was defined and clearly distinguished from leukæmia, with which it had previously been confused, and a valuable insight was given into the nature of the latter disease.

Soon after the commencement of his *Archiv* he began to publish articles in that journal which foreshadowed the appearance in 1858 of his *Cellular Pathology.* In that work, which is the foundation of modern pathology,

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the researches of Schleiden and Schwann upon the cellular structure of vegetable and animal organisms were confirmed and further elaborated, and the part which the cell plays in pathological processes was established for the first time. Recognising the value of Schwann's theory as showing that all physiological activity must be referred ultimately to the cell, that the cell is the seat of life, and that vital manifestations are due to its activity, Virchow showed that the same principle was equally valid for pathological relationships, and that in an abnormal modification of these same cellular activities is to be found the explanation of disease. But Virchow did not simply adapt Schwann's theories to his own subject, he reconstituted them. "According to Schwann," he declared in his lectures, "the intercellular substance was the cytoblastema, destined for the development of new cells. This I do not consider to be correct." He substantiated his objection by proving that the theory of cell formation out of a conglomeration of granules in a blastema was erroneous, and must be replaced by his now famous dictum, *Omnis cellula e cellula*. The theory that every cell arises from a pre-existing cell, together with the recognition of the cellular character of the connective tissues, revolutionised pathology by introducing the new principle that all pathological cell formations arise from the division of normal cells. The scientific bearings of these discoveries are best described in Virchow's own words. In his Croonian Lecture delivered before the Royal Society in 1893 he traced the sequence of ideas which had led up to his cellular theory, and expressed its results in the following terms :—"The begetting of a new cell from a previous cell supplements the reproduction of one individual from another, of the child from the mother. The law of the continuity of animal development is therefore identical with the law of heredity, and this I now was able to apply to the whole field of pathological new formation. I blocked for ever the last loophole of the opponents, the doctrine of specific pathological cells, by showing that even diseased life produced no cells for which types and ancestors were not forthcoming in normal life."

His researches have given us our knowledge of the pathology of pigment formation, lardaceous disease, disease of cartilage, trichiniasis, and cretinism. He has contributed largely to the histological knowledge of the infectious diseases such as syphilis, leprosy, cholera, and diphtheria. The study of the tissue changes which take place in tuberculosis was part of his earlier work, and he has always maintained a keen interest in that disease down to the end of his career. In 1891 he raised a warning voice against the therapeutic danger of Koch's inoculation treatment, and, in stern denunciatory tones which will long be remembered, demonstrated on the brain from an inoculated patient, "such a colossal hyperæmia not only of the pia mater but also of the brain substance itself, that I cannot recall ever having seen anything which even bore a resemblance to it." The same cautiously conservative attitude was apparent in his criticism of Koch's startling pronouncement of last year upon the difference between human and bovine tuberculosis. He thought that Koch had gone too far in excluding altogether the possibility of the transference of tuberculosis from cattle to man by means of food, and considered that certain unusual developments of abdominal tubercles which he met with occasionally in his post-mortem experience were at all events suggestive of such a source of contagion. Very characteristic, too, was his insistence on the importance of recognising that a tubercle was "not merely something which contained

tubercle bacilli, but must be composed of cells which can be called tubercle cells." For his general attitude towards the latest theories of bacteriology and immunity the best reference is his Huxley Lecture, delivered in 1898, where we find the same leading idea which dominated the whole of his life's work, that whatever other agencies may be associated with the production of disease, it is in the vital activities of the tissue cells themselves that the actual explanation of morbid processes will ultimately be found.

The value of Virchow's work is not measurable in standard terms of ordinary praise, because we have had no pathologist with whom to compare him. As the founder of modern pathological methods he has created an influence which is so intimately associated with the work of all subsequent investigators that it is impossible to discriminate the limits of his achievements or apportion his share of credit for raising the science to its present position. His conservative and critical attitude towards some recent branches of pathological research must be regarded not as the antagonism of an ordinary controversialist, but as the warning counsel of a master who, from the standpoint of his own high ideal—the absolute certainty and all-pervading importance of the cellular theory—bids us never rest content with our researches into the infective processes until we have established for them the same convincing certainty and transparent truth which has made his own theory the instrument of paramount importance for every fresh acquisition of medical knowledge. His cautious scepticism need not therefore be regarded as disparagement nor be attributed to lack of appreciation, but should rather be recognised as a stimulating challenge to further efforts, which we are determined shall be successful in overcoming the obstructions and limitations he warningly indicates. There is no higher ideal which pathological investigators can place before their minds than to bring their work to such a pitch of convincing certainty as to feel that from Virchow himself, were he alive, their results would have gained the unqualified approval due to incontrovertible facts.

SOME PERSONAL REMINISCENCES.

Sir Felix Semon, C.V.O., who was a pupil and personal friend of Professor Virchow, kindly contributed the following reminiscences of the great pathologist to the Editor of the *British Medical Journal.*

"It is now more than thirty years since I was presented to him, and I shall never forget the occasion of my introduction. Shortly after the end of the Franco-German War I was riding in the Thiergarten of Berlin when I was hailed by a relative of mine, a member of the Berlin Town-Council, returning from a meeting of that body in company with Professor Virchow, who was then, and indeed until a few years ago continued to be, one of the most energetic and influential members of the Berlin municipality. My relative presented me to the Professor, who directly pronounced the horse I rode a thoroughbred, and entered upon a disquisition on its qualities in a manner which fairly took my breath away. If he had authoritatively spoken about the latest phase of Prince Bismarck's policy, about the canalisation of Berlin, about some recent discoveries of lake-dwellers' habitations, or of tumuli in Pomerania, or about a recent attack on his cellular pathology—one would have thought it perfectly natural in view of his well-known universality; but that the Leader of the Radicals in the German Reichstag and the Prussian Parliament, the Berlin Town Coun-

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cillor, the President of the German Anthropological Society, the Professor of Pathological Anatomy in the University of Berlin, and the member of innumerable learned societies, should be able to discuss with equal authority the points of a thoroughbred—was indeed more than I had expected. At any rate it filled me at once with profound respect for the universality of his information, and this feeling deepened as years rolled by, and as I had the privilege of more and more frequently and intimately coming into contact with him. Whilst his knowledge of medical literature of all times and all nations was simply phenomenal, his acquaintance with all events of the day, with the progress of general science, with history, geography, general literature, art, was equally astounding. And what was most impressive was that his knowledge in all these various branches—the complete mastery of any one of which usually is looked upon as a very creditable achievement—was as thorough as it was general. Virchow, in fact, was nothing if not exact, and it was one of his most characteristic features that he demanded the same exactness in thought and expression which distinguished him from everybody with whom he came in contact. His critical faculties were, so to say, instinctive and ever on the alert. He rarely allowed an inexact or random statement inadvertently made in his presence to pass without correcting it, and when his own work came into question he was positively inexorable in his demands concerning the absolutely exact rendering of his meaning. I have had some experience of this in connection with the translation of a few of his addresses into English. As a rule, when invited to give an address in this country, he sent his German manuscript for translation some time before he arrived, and it need not be said that only first-rate men were entrusted with this responsible task. As a matter of fact all his English addresses known to me were magnificently translated, and the author himself, when first glancing over the translation, was delighted. But he then usually withdrew into his room (ever since 1881 when coming to London he did me the honour of staying with me), and shortly afterwards there was a little knock at my door. So soon as I heard that knock I knew what was coming, and my misgivings were rarely falsified. He thought that such and such a phrase did not exactly enough render his meaning, and after he had once embarked upon that course there was no holding him. He grimly insisted on getting exactly what he wanted, and I remember at least two occasions when he was still actually correcting his manuscript whilst his audience was already assembling, and when I had the greatest difficulty in getting him on to the platform in proper time. Admirable as this was, it cannot be gainsaid, I am afraid, that his love of exactness occasionally amounted to a certain degree of pedantry. Thus, how often did he drive some unfortunate candidate whom he examined into sheer despair, because the youth did not exactly enough describe the *colour* of a specimen, and called it 'pink' while he ought to have said 'violet!' How often did he suddenly interrupt himself in the midst of a most interesting pathological lecture, in the course of which he had sent round among the audience some illustrative specimens, and personally apostrophise an unsuspecting student in anything but complimentary terms, and at very considerable length, because he had noted that that unlucky individual had held the glass containing the specimen somewhat obliquely, and because he feared that the spirit of wine in which it was preserved might touch and spoil the varnish by means of which the cover was sealed.

"In this connection I may say at once that my dear old master never was very gentle with his students, and that, particularly as an examiner, he was terribly feared. I have often wondered and never been able to understand why just on these occasions he should have so much departed from his usual quiet demeanour and have terrorised the innocents to such a degree that many of them actually forgot the little they knew. But whatever the explanation the fact remains. The number of anecdotes known in connection with this peculiarity of his is simply legion, and it may not be amiss in a memoir of this character if by way of illustration I related part of my own experiences with him when I passed my State examination. I ought to premise that on the last occasion on which I had seen him, namely, after passing my examination for the M.D. of Berlin, he had been kindness personified. Well, the day before I was up for the pathological 'station,' as it is called, of the State examination, I had to deliver a message from the clinic of the late Professor Traube, as one of whose clinical clerks I then acted, at the Pathological Institute. Virchow's assistant was just engaged in making a necropsy, and, seeing me, asked whether he was mistaken in thinking that I was to be under examination next day. On my confirming his impression, he said, 'Well, you had better look at this. It is a thing one does not see every day, namely, a melanotic sarcoma with numerous metastases. Who knows but that you may not be examined on that very subject.' I thanked my friend for his kindness and asked for a little piece of the tumour. My request was willingly granted, and after my return home I examined the growth under the microscope, and read up all I had put down on sarcoma in my memorandum book when listening to Virchow's own lectures on the subject.

"Next morning the eight victims about to be immolated appeared at the appointed time—8 A.M., punctually—in evening dress (such was, and possibly still may be the ridiculous fashion) at the Pathological Institute. It was customary that two of the candidates should begin by making necropsies simultaneously, two should write the protocols of these examinations under their comrades' dictation, two should prepare on the spot microscopic specimens, and the two remaining ones should be examined *viva voce*. After a while they all exchanged their occupations. In which order they were to begin was left entirely to the examiner's decision, so that nobody knew beforehand what was first in store for him.

"Well, we waited and waited two mortal hours for the arbiter of our destinies. (I shall hereafter have something to say about Virchow's general unpunctuality.) At last we espied him through the window, rushing up the little incline which led to the door of the old Pathological Institute. We grouped ourselves in a semicircle and received him with a deep bow. Without deigning to explain by a single word his late appearance, he immediately and not in the gentlest tone either, addressed me personally: 'I suppose you are waiting for the permission of a magistrate (*obrigkeitliche Erlaubniss*) to open your microscope?' Seeing that I could not have the remotest idea that I should have first to use the microscope this was certainly a stunner. I, of course, did not reply, and made my microscope ready, whilst he ordered the other candidates about. 'The two gentlemen who are to make a microscopic examination, to come here! There, sir (addressing me), is something for you.' Oh, joy! It was the melanotic sarcoma! I turned round to look for a wooden tray on which to place the piece of tumour held out to me by the Professor, when I again heard

his voice in its most caustic tones: 'That is quite like your own dear self! Why look afar when what you desire is near?' (In German he quoted Schiller:

"Warum in die Ferne schweifen?
"Sieh' das Gute liegt so nah'!)

'If you had only condescended to look in front of you, you would have seen a tray on the table before you.' This was true enough, but certainly not very encouraging. However, I received my piece of tumour and withdrew to the window, where I placed my microscope. There I prepared as characteristic a slide of the growth as I could, and waited for the dreaded moment of his coming to me. Meanwhile he raged about amongst my unfortunate comrades, like furious Ajax amongst the herds of the Achæans. At last I heard his voice behind me: 'What have you got there?' The accumulated experience of many generations had taught candidates under no circumstances to begin by giving a diagnosis, and merely to describe appearances. This I did whilst he was attentively examining the preparation under the microscope. When I had finished he looked up, pushed his spectacles up, looked at me straight with his piercing eyes, and asked: 'You see that?' Greatly surprised, I answered, 'Yes, sir.' 'I don't,' was the reply; and next moment he was far away, scolding another candidate. I remained behind, much bewildered. Surely it was a sarcoma; surely I had given him a correct description? At last it dawned upon me that perhaps my preparation, although I had considered it a beauty, was not good enough for him. So I sat down again and laboriously fitted up another, which really was most characteristic. After about an hour I heard his voice again behind me: 'What have you got there?' 'The same, sir, that I reported when first you asked me.' 'What was that?' I repeated my description. He again looked up when I had finished, again pushed his spectacles up, looked at me again, and said: 'You appear to possess an excellent memory, and to have learned by heart the pages of your memorandum book.' With this shrewd but enigmatic remark he ran away again, leaving me this time absolutely nonplussed. I looked at the preparation under the microscope as he had left it. Surely there was all I had described. What to do now? After some deliberation I decided to do nothing, and simply to wait for the development of events. After another hour he came up again with the same question he had twice before addressed to me. I replied that I could only repeat what I had said before. 'What do you think it is?' 'A melanotic sarcoma, sir.' 'You may go home.' And thus ended the first day of my examination in pathological anatomy, leaving me absolutely uncertain whether I had passed this part satisfactorily or whether I had been ploughed in it. After some very tempestuous occurrences on the second day I ultimately found that I had passed, and very satisfactorily, too, but I cannot honestly say that these two days were amongst the happiest of my life.

"Although experiences of that kind were for nearly half a century the rule, not the exception, amongst the candidates who presented themselves for examination at Berlin, Virchow, particularly during the last twenty years of his life, when the historical halo had begun to form which so happily surrounded his last phase of life, was very popular amongst his students. They had sense enough to see in him one of the greatest personalities of our times, they were happy and proud to be his pupils, and they came to look upon the examination as an unpleasant but unavoidable

elementary necessity. The *Festkommerse* in his honour on the occasion of his seventieth and eightieth birthdays eloquently testified to his popularity amongst the youngest generations of students; whilst his older pupils came to be devoted to him with truly filial love. Nothing, for instance, could be more touching than to hear the late Dr. Wilson Fox speak of Virchow. He looked up to him, fine man though he was himself, as to a superior being. Virchow himself was very fond, and, as he well might be, very proud of his former assistants. To very few men it is given, as it was to him, to educate such a 'school' of brilliant men as he did; and whenever he spoke of them, it was with paternal pride and affection. And how could it be otherwise when such men as Cohnheim, von Recklinghausen, Waldeyer, Ponfick, and Grawitz—to mention but a few—were amongst them.

"Altogether, to see my dear old master in his most gentle and most genial mood, one had to see him in the circle of his family and friends. At great public gatherings, such as the International Medical Congresses, of which he was a regular visitor, and at which he naturally formed the centre of attraction, he was amiable and kind enough, although occasionally, when people who had no earthly claim upon his time and attention bothered him overmuch, he disposed of them in very curt and peremptory fashion. In the course of political or medical discussions, when his ire had been roused, he was a truly formidable opponent, demolishing his antagonists whilst hardly ever raising his voice, by the force of inexorable logic, accurate information, and icy irony; whilst at other occasions, when he disdained to descend into the arena, the mere half-amused, half-sarcastic expression of his face was enough to confound his adversaries. But the most charming side of his character—his love for his family, his indulgence for his friends, his chivalrous kindliness towards women, were only revealed to a favourite few. His family simply adored him—his wife, his faithful companion for more than fifty years, had no other thought beside him, and those whom he honoured by his friendship vied with one another in making his path as smooth as they could."

Of England he was ever a staunch friend. Various circumstances concurred to confirm this predilection. In the first place, the liberal institutions of this country appealed to his own political instincts. He was reared at a time when the whole Continent of Europe suffered from that reaction which followed the Napoleonic wars, and when England alone was the bulwark of political freedom. He, himself the protagonist of the claims of the educated middle classes towards a very different position and appreciation in the body politic from what was accorded to them by the bureaucratic and feudal régime dominant in Prussia before 1848; himself a martyr to the convictions he fearlessly expressed after having witnessed the Silesian typhus epidemic of 1846, saw his own ideas of civil liberty realised in England, and admired it for this reason. Secondly, familiar as he was with medical literature of all countries and all times, he found much in the writings of various British medical worthies that was congenial to his own mode of thought. Thus, I will remember how he always held up to his students John Goodsir as a model of keen and accurate observation; thus many of the readers of this will remember the eloquent tribute he paid in his Croonian lecture to the achievements of Glisson. Thirdly, he had many devoted English friends, whose feeling of personal attachment he warmly reciprocated. I have already mentioned Wilson Fox; I may

further mention Professor Huxley, Sir James Paget, Lord Lister, Dr. Pye-Smith. He also had the highest opinion of poor Kanthack, whom we have lost much too early, and of Mr. Shattock, whose preparations at St. Thomas's Hospital Museum he was in the habit of praising very enthusiastically. With Sir James Paget and his family an almost life-long friendship united him, and it was extremely touching when Sir James, who had long retired from all participation in social functions, drove up, shortly before his death, to call on Virchow, and when the latter descended into the street to exchange a few kindly words with his old friend. Equally touching it was when, on the occasion of the small dinner given by Virchow on the occasion of his eightieth birthday to his family and a few intimate friends, he did such eloquent homage to the greatness of Lord Lister's work, that the latter could hardly restrain his emotion. Nothing could have been more elevating, more stirring, than this tribute of genuine admiration paid by one great man to another. Finally, as explaining his particular liking of England, I can testify to the gratitude which Virchow felt, and more than once freely expressed to me, for the warmth of the receptions he always met with when visiting our shores. It will be in the recollection of many readers of this, that his two last visits to this country, namely, when he delivered the Croonian and the Huxley Lectures, were a real sort of triumphal progress. He cherished the memory of the goodwill and enthusiasm then bestowed upon him amongst his most valued recollections.

I have incidentally mentioned his habitual unpunctuality. At the time when I was a student at Berlin this used to be made a subject of great complaint, particularly with regard to his professorial duties, and it cannot be denied that it was very aggravating, when the lecture to which one looked forward most eagerly in one's day's work was often unduly curtailed through the lecturer's late appearance, or even omitted altogether. But how could it be otherwise with that unique man's unique activity? His day was not an ordinary man's day; he compressed into it the work of several industrious men!

Let me sketch one such day. He would conduct an examination from 8 to 10, would superintend a microscopic class from 10 to 12, would lecture from 12 to 1, would be in the Reichstag from 2 to 5, in the Town-Council from 5 to 6, in some committee meeting of the Prussian Parliament from 6 to 7, and preside at the meeting of the Berlin Medical Society or at the Anthropological Society, or deliver some popular address, or again do committee work from 7 to 9. Well may I be asked, But where did his meals come in? Where did all his enormous original and editorial literary work, his correspondence, his family life come in? Well, that is the wonder of all who had the privilege of coming near him. One of the explanations of his superhuman activity is that he required infinitely less sleep than most mortals. When I was a student in Berlin there was a sort of legend that he never slept more than five hours. When later on I had the great good fortune of being admitted into his family circle, I asked whether there was any truth in that legend, and to my surprise learned that often it fell far behind the truth, and that more than once he had, when under—what was for him—exceptional pressure of work, not gone to bed at all, but worked through the whole night! Honour to a man who thus sacrifices himself for the public weal, and every allowance for his unavoidable unpunctuality! Strait-laced people may object that a man ought not to undertake more work than he could punctually fulfil, but whilst this in

the case of ordinary mortals is true enough, the reply in Virchow's case is that the world in many respects would have been much poorer had this wonderful man limited himself to the ordinary professor's work, and not shed the lustre of his personality, of his lofty mind, of his inexorable logic upon politics, municipal work, anthropology, ethnology, and a hundred other branches of human thought. If a few details of his routine work necessarily suffered from his physical inability to be in several places at once, the whole human race benefited from the application of his master mind to so many different human interests. In the description which I gave last year in these columns of the celebration of his eightieth birthday, particular attention was drawn to the fact that nothing had been more impressive in the homage done by representatives of all civilised nations to this "grand old man of science" than the universality of interests in which they agreed that humanity had been benefited by him.

And now, so soon afterwards, he has been taken from us. We shall not see him any more in the flesh, as "Spy" has luckily preserved him for us in one of *Vanity Fair's* most brilliant and characteristic cartoons: the little, slightly bent, lithe man, with the parchment-like, somewhat yellowish, much wrinkled face, and the slightly grizzled hair, which remained practically unchanged during the thirty years I have known him; with the small piercing eyes, covered by spectacles, which he always pushed up when reading or when about to make one of his caustic remarks; with his dry, sarcastic, somewhat monotonous voice; with his rapid gait, with his quiet, unostentatious demeanour—in every respect the best type of a German professor.

ARMY VETERINARY DEPARTMENT.

THE following Civil Veterinary Surgeons have returned from South Africa, having claimed their discharge on termination of engagement:—Civil Veterinary Surgeons A. D. Lalor, W. Jowett, Twist, and G. H. Barber.

Civil Veterinary Surgeons W. B. Gridley and J. P. Stableford, have been invalided from South Afrtca, and granted three months' sick leave of absence.

Veterinary-Captain E. E. Martin has been appointed Assistant Professor, Army Veterinary School, Aldershot, vice Veterinary-Major J. A. Meredith, F.R.C.V.S., appointed to 1st Life Guards.

The following Veterinary-Lieutenants have been promoted Veterinary-Captains:—F. Ulysees Carr, F. W. Hunt.

Veterinary-Captain F. D. Hunt, Remount Department, has left for India on return from leave of absence.

XUM

CONTAGIOUS DISEASES ANIMALS ACTS, 1864 AND 1890.

SUMMARY OF RETURNS OF OUTBREAKS for the Four Weeks ending 13th September 1902.

ENGLAND AND WALES.

Swine Fever.	Anthrax.	Glanders (including Farcy).	Sheep-Scab (for month of August).
Outbreaks 85 Slaughtered 392	Outbreaks 32 Attacked 41	Outbreaks 115 Attacked 199	Outbreaks 15

SCOTLAND.

Outbreaks 3 Slaughtered 54	Outbreaks 15 Attacked 22	Outbreaks 2 Attacked 3	Outbreaks 2

IRELAND.

Outbreaks 20 Slaughtered 248	None.	Outbreaks 2 Attacked 9	Outbreaks 14

Communications, Books, Journals, &c., Received.

Agricultural Journal (Cape of Good Hope); Berliner Thierärztliche Wochenschrift; La Clinica Veterinaria (Milan); Deutsche Thierärztliche Wochenschrift; Tannoform in Veterinary Medicine (March); The Sanitary Journal; Scottish Medical and Surgical Journal; Veterinary Record; La Riforma Veterinaria; Le Mois Scientifique (Paris); L'Echo Vétérinaire (Liège); Annales de Médecine Vétérinaire (Brussels); Johns Hopkins Hospital Reports; Journal of Comparative Medicine and Veterinary Archives; Recueil de Médecine Vétérinaire; Gazette Médicale de Paris; Modern Medicine; Johns Hopkins Hospital Bulletin; Il Veterinario di Campagna (Moncalieri); Le Bulletin Vétérinaire (Orleans); Revista de Medicina Veterinaria (Bucarist); La Revista Veterinaria (Buenos Aires); Zeitschrift für Fleisch-und Milchhygiene (Berlin); Buletinul Societatii de Sciinte diu Bucuresci-Romania; The Meat Trades Journal; The Dental Record.